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VEGETATION AND SOILS OF THE COW CREEK WATERSHED

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A C K N O W L E D G M E N T S

The authors wish to express appreciation to E. A. Moore, District Manager, Bureau of Land Management, Winnemucca, Nevada for historical information about the watershed.

We wish to thank all those people who have been of assistance by making suggestions, reviewing portions of the manuscript or helping with the field work.

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VEGETATION AND SOILS of the COW CREEK WATERSHED

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Map Cow Creek Watershed

INTRODUCTION

The Cow Creek Watershed is located in northern Pershing County in the vicinity of Rabbithole about 42 airline miles northwest of Lovelock, Nevada (Fig. 1). The watershed is bounded by the Seven Troughs Range, Kamma Mountains, Majuba Mountains and Poker Brown Gap. The Black Rock Desert is approximately 10 miles to the north.

The basin is within the Gerlach Resource Area of the Winnemucca District of the Bureau of Land Management. It consists of approximately 114,000 acres (179 square miles) of which 91,900 acres (143.6 square miles) are public domain. Most of the private land is owned by the Southern Pacific Railroad Company. Many unpatented mining claims and some mill sites have been located in the area since the late 1800's. Indications of past mining activity are found throughout the area. The watershed lies within the northern part of the Basin and Range Physiographic Province and consists of north-south trending mountains separated by valleys or canyons (Hunt, 1967). The altitude of the highest peak is around 7000 feet and the basin outlet is approximately 4300 feet. Relief between the mountains and adjoining valleys or canyons rarely exceeds 2100 feet.

Geologic parent materials consist mainly of andesite and alluvium with some shale, sandstone and conglomerate.

Water in the basin flows briefly in ephemeral streams from snow melt or thunderstorms. Drainage is to the Black Rock Desert. Few perennial springs are found.

The climate of the basin is arid. Annual precipitation for a 4-year period (1964 through 1968) ranged from 4.5 to 8.8 inches. Comparisons with known records at Lovelock indicated one below average, one average, and two above average precipitation years. A majority (70 percent) of the precipitation falls in November, December, January, March, June and August (Fig. 2).

During the period 1897 to 1967, approximate temperature of the lower elevations of the watershed ranged from a low of -30°F to a high of 110°F with the average annual temperature of 51.7°F.

Three vegetative zones are represented in the watershed. These are salt desert shrub, northern desert shrub, and juniper. Soils are mostly Aridisols although some Mollisols and Entisols are found.

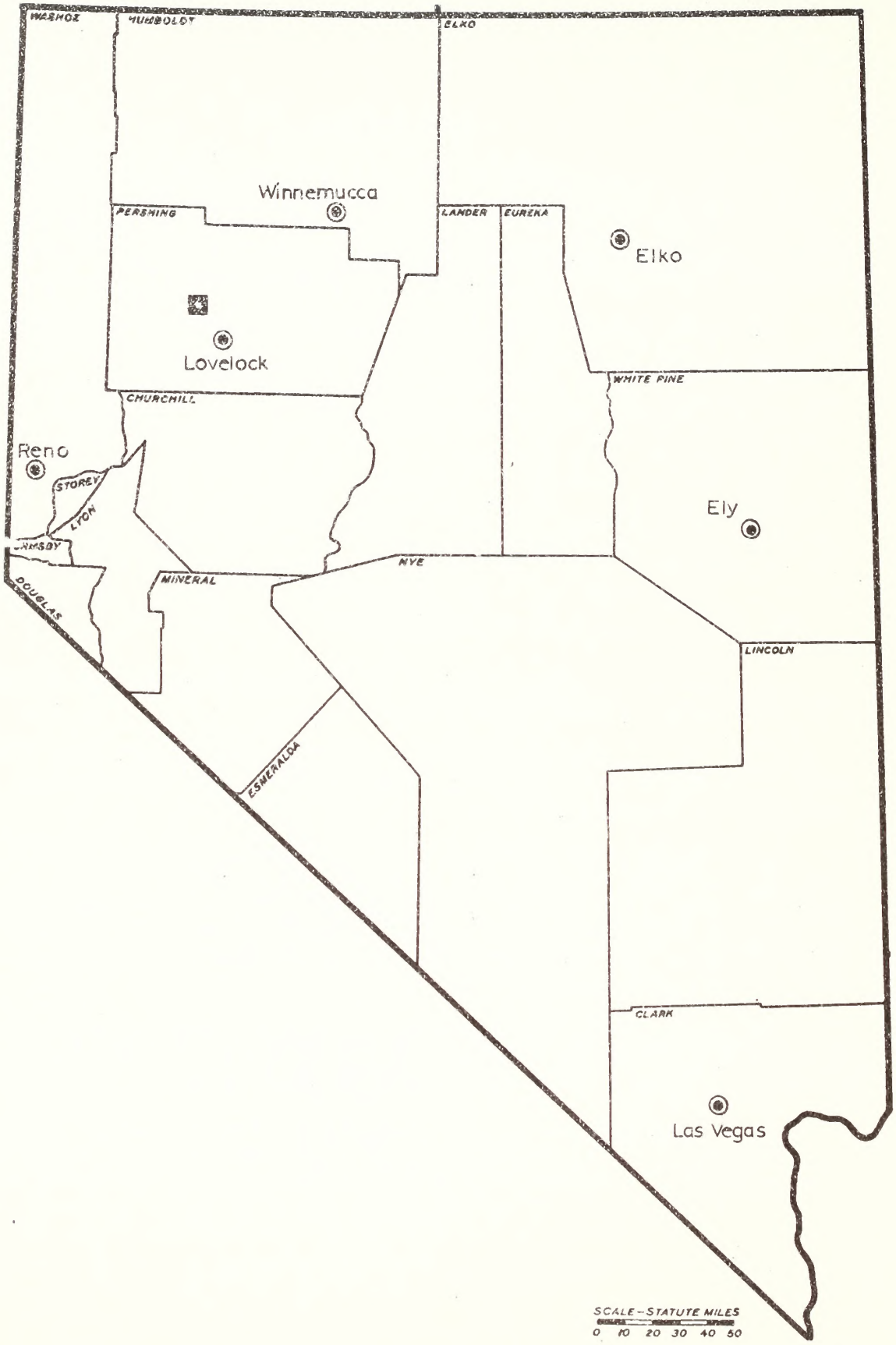

Figure 1. Location of The Cow Creek Watershed in Nevada

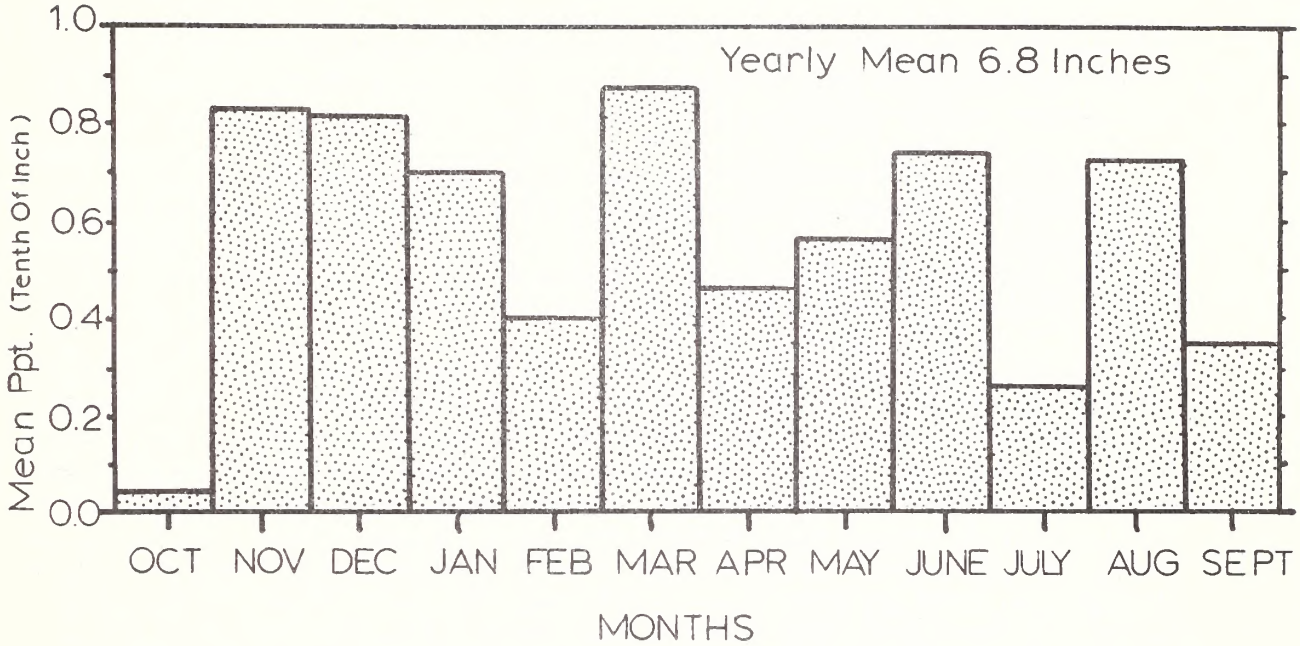

Figure 2. Mean monthly precipitation for the Cow Creek Watershed

Livestock use of the basin has been by cattle, sheep, and horses in undetermined numbers. At present all the accessible portions are grazed during some seasons of the year by cattle or sheep. The watershed is within two grazing units, the Seven Troughs - Rosebud and the Rye Patch. For this reason, it is difficult to estimate the number of livestock which actually use the Cow Creek Watershed. In the Seven Troughs Unit, there is one cattle and two sheep operations which run in a common allotment. Rye Patch Unit, in the vicinity of the Watershed, is used by one cattle operator. The sheep operators use the general area with approximately 6100 head from December 11 to February 28 of each year. The cattle operators use the area with 300-400 head of cattle from April 15 to December 31 of each year. The limiting factor for livestock use in the area is the availability of water.

Wildlife is not abundant in the area. What is there consists of chukar partridge, a few rabbits, rodents and mule deer.

Recreation use is low. The few annual visitors are primarily interested in visiting historic mining ruins, rock hounding, and hunting (chukar partridge).

Management of the watershed was instituted under the Taylor Grazing Act of 1934. The first effective step in management was the range adjudication completed in 1965. Livestock numbers and season of use were based on range surveys. Better livestock distribution has been achieved by spring development.

Land managers constantly require factual information on which to base their programs. There is a special need for detailed data about the vegetation and soils on rangelands. Material included in this report describes the climax and seral units of vegetation and associated soils in the Cow Creek Watershed. This is one of 12 range watershed study areas in Nevada administered by the U. S. Department of the Interior, Bureau of Land Management. The vegetation-soil analysis herein reported is a portion of a cooperative research effort between the Bureau of Land Management and the Renewable Resources Center of the University of Nevada.

This study was designed as a multiple-purpose ecological inventory of vegetation and soil resources. The study provides fundamental information which can be interpreted and re-interpreted as use patterns change and as understanding increases without the need for a complete re-survey as new uses are emphasized.

The value of data outlined in this report lies in the development of relationships between vegetation and soil and the resultant indicator significance of vegetation. For example, a classification of the basic ecological units is necessary for a through understanding of the landscape and for interpretation of site potential. Site potential for a given vegetation-soil unit, however, requires further analysis and the accumulation of data about the value of a management practice if it were applied to the unit in question. Much of these data are not yet available.

Management recommendations are curtailed due to a lack of data relating to vegetation-soil units described herein. When such data become available, however, the land manager will be able to easily identify sites within the confines of his unit of responsibility upon which a given practice or management program has been found desirable. An enhanced ability to precisely define range landscapes constitutes the real value of this analysis.

We have attempted to define the vegetation-soil units on the basis of a habitat-type classification. A habitat-type, as defined by Daubenmire (1952) is "the collective area which is capable of supporting the same honogeneous climax plant association." Collective area means a unique ecological entity which can be delineated on a map or aerial photograph. The habitat-type concept indexes site potential since it is an expression of the ultimate unit of the sum environment with regard to vegetation, soil classification unit, topographic placement and, by inference, micro- and mesoclimatic factor.

As an example, we have interpreted the *Poa nevadensis/Carex* sp. community to be a habitat-type based on its homogeneity, recurrence, productivity, relict areas, and apparent equilibrium with its environment. When a community is not climax, careful evaluation of plant, soil, physiographic and climatological data is necessary in order to speculate as to the probable habitat-type with its specific potential. The *Artemisia arbuscula/Poa secunda* community is an example of seral vegetation. This community occurred on similar soil with similar physiographic placement and climate as *Artemisia arbuscula/Festuca idahoensis* stands found elsewhere. On these bases, the *A. arbuscula/Poa secunda* community was interpreted to be an *A. arbuscula/F. idahoensis* habitat-type. Similar evaluations have been made for most of the communities recognized in the watershed.

The first section of this report is a key to the 14 plant communities. This key refers the reader to the second section, a detailed description of each community. The third section is devoted to a discussion of management suitabilities and ecology of the watershed. This is followed by the appendices which contain precipitation data, soil families and sub-groups associated with the watershed plant communities, and a vegetation and soil association table. Finally a watershed map illustrates mapping units which consist of plant communities with their respective percentage indicated, roads, precipitation gages, townships, ranges and sections.

Methodology

The vegetation of the Cow Creek Watershed was delineated into plant communities during a reconnaissance. As a general rule, all communities were recognized and delineated on the basis of vegetative characteristics alone. Then as soil and physiographic data were accumulated, this initial delineation was re-evaluated on several occasions until the 14 plant communities described in this report were finally identified and interpreted. These communities were given names corresponding to the major dominant and major sub-dominant species.

Basal Area and Cover Data

After the plant communities were delineated, an intensive study was initiated by an adaptation of methods described by Poulton and Tisdale (1961) and further modified by Tueller (1962).

A 100-foot-square macroplot was used. Five plots were considered ample to adequately describe a community (Eckert, 1957) but on minor or inaccessible communities, only one or two plots were used.

Permanent macroplots were established by running a 100-foot baseline up and down the slope. Plots placed on the level were oriented north and south.

Within each macroplot, four 4- x 50-foot belt transects were randomly located perpendicular to the baseline. Randomization was restricted to prevent transect overlap and to provide for two transects each in the upper and lower half of the plots. This two-way randomization provides for adequate sampling of the full length of the macroplot (Eckert, 1957).

Each belt transect was divided into ten 4- x 5-foot plots thus enabling forty 4- x 5-foot plots to be studied in each macroplot. Two kinds of data were obtained from each plot: (1) basal area of the more abundant grasses and herbs, and (2) crown cover estimates of shrubs. A 1-square-foot frame was used as an estimation guide for both basal area and crown cover data.

Basal area was selected because it is relatively free from yearly weather variations and grazing influences (Tueller, 1962). Dead centers which exceeded 25 percent of the area of bunchgrasses were excluded from the estimate. Basal area estimates by species were based on the following cover classes (Poulton, 1962):

Class	Class Range Percent	Midpoint Percent
1	0 - 1	0.5
2	1+ - 5	2.5
3	5+ - 10	7.5
4	10+ - 25	17.5
5	25+ - 50	37.5
6	50+ - 75	62.5
7	75+ - 95	85.0
8	95+ - 100	97.5

The midpoint of each class range was used to calculate cover percentage.

Shrub crown cover estimates were obtained by standing directly over the shrub and projecting the foliage cover onto the ground. Estimates were made for each species to the nearest 1 percent of the 4- x 5-foot plot. Openings in the canopy larger than one-quarter of a square foot were not included.

Cover data of species in the meadows were obtained by using the point frame method as described by Levy and Madden (1933).

Tree Density and Cover Data

Density (trees/acre) and crown cover of juniper were obtained from a 66- x 132-foot plot using four maturity classes (Bradshaw and Reveal, 1943). Trees rooted in the study plot were counted and crowns measured by maturity class from which density and crown cover was calculated.

Frequency Data

Frequency, according to Cain and Castro (1959), is percent presence in plots of a stated size. For example, if a sample of a stand consists of 200 plots, and if one or more plants of a given species occurs in 50 of these plots, the species has a frequency percentage of 25.

Frequency sampling procedures developed by Hyder *et al*. (1963) were used to supplement cover estimates on each macroplot. Although frequency data are difficult to interpret, the speed and objectivity inherent in the method makes them useful when comparing areas where high statistical precision is needed (Tueller, 1962). Ten frequency transects, each with 20 presence or absence determination quadrats, were located perpendicular to the baseline. Each transect consisted of twenty 20- x 20-inch or 30- x 30-inch quadrats placed contiguously and moving away from the baseline. Only those plants rooted inside the frequency quadrats were recorded. A two-stage randomization was applied to these transects: (1) restricting five transects to each half of the macroplot, and (2) preventing transect overlap.

Ground Cover Characteristics. Ground cover characteristics were determined by an adaptation of the point frame method as described by Godall (1952). The same 200 frequency plots were used to sample cover but instead of recording presence of vegetation, the bottom tip end of the frequency frame was used as a point. Hits of bare ground, litter, pavement (1/4 to 1-inch diameter), rock (1-inch plus diameter) and lichen cover, when present, were recorded.

Constancy - Cain and Castro (1959) define constancy as "the percentage of occurrence of a species on samples of the same size in various stands of a community type".

Species constancy percentages were calculated for each macroplot. In order to develop a complete species list for constancy, each 100- x 100-square foot macroplot was examined carefully after obtaining cover and frequency data. Additional species encountered were added to the list.

Topographic and Physiographic Features. Topographic features of each macroplot were characterized as follows: position on the slope whether top, upper one-third, center one-third, lower one-third, or bottom, slope in percent obtained from an abney level, and aspect from an 8-point compass.

Physiographic placement of each macroplot was characterized as follows: land form - drainage bottom, escarpment, fan, floodplain, plateau, flooded depression, ridge top, slope, lake-marine, or river terrace; macrorelief - flat, undulating, rolling, butte, hilly, or mountainous; microrelief - uniform-flat, convex, concave, interrupted-mount, pits, ridge and swale.

Soils study - A soil profile description was made at each macroplot using the procedures outlined in the Soil Survey Manual (1951) and the Seventh Approximation (1960) plus revisions (1967). Horizons, soil color, texture, pH, lime content, structure and consistence were noted for each profile.

Lack of time and money prevented complete laboratory soil analyses. The following parameters were selected because they have been suggested to be indicative of vegetation and soil relationships (Eckert, 1957). Samples from the A1 and B2 horizons were analyzed for conductivity (millimhos per centimeter), pH (from a saturated paste), and organic matter (percent). Cation exchange capacity (milliequivalents per 100 grams) was determined only on those samples from the A1 horizon (USDA Handbook No. 60, 1954).

Family level identifications were made as found in the Seventh Approximation (1960) and revisions (1967). When more than one profile description per family occurred, the modal description was used noting that family.

Each soil was classified as to hydrologic group (Nevada Dept. of Conservation and Natural Resources and the USDA, 1965); stoniness (USDA, 1951); and estimated water holding capacity based on clay mineralogy and texture (Schokley, 1955). Available water holding capacity

was estimated for the rooting depth or to the depth of the soil profile studied if not otherwise stated. Rooting depths were limited by duripans and lithic or paralithic contacts.

Soil boundaries were not physically located and a soil map was not made. Thus detailed comparisons of soils across the boundary were not possible or within the scope of this study. Only the soils at the macroplots were described. The kinds of soils noted at the macroplots are commonly associated with the different kinds of vegetation in this watershed.

Erosion - Current erosion of each vegetation-soil unit was classified using classes developed by the Forest Service (USDA, 1964).

Climatic Data - Precipitation data were taken for a 4-year period from non-recording rain gages placed throughout the watershed. The data were then related to each applicable community in inches of annual precipitation.

Temperatures were estimated from existing records at Lovelock, located about 42 airline miles to the southeast. The climate is similar to that of the lower elevations of the watershed.

KEY TO THE PLANT COMMUNITIES in the COW CREEK WATERSHED

A. Communities with a juniper *(Juniperus osteosperma)* overstory.

B. *Artemisia arbuscula* dominant in the shrub layer with a *Poa secunda* understory .....*Juniperus osteosperma/ Artemisia arbuscula/Poa secunda* Community..... (p.30)

BB. *Artemisia tridentata* dominant in the shrub layer with a *Poa secunda* understory..... *Juniperus osteosperma/ Artemisia tridentata/Poa secunda* Community..... (p.32)

AA. Communities not as above

B. Communities dominated by *Artemisia*

C. *Artemisia arbuscula* dominant in the overstory with a *Poa secunda* understory.....*Artemisia arbuscula/ Poa secunda* Community..... (p.12)

CC. *Artemisia tridentata* dominant in the overstory

D. *Poa secunda* the most abundant grass ..... *Artemisia tridentata/Poa secunda* Community..... (p.18)

DD. *Grayia spinosa* a codominant..... *Artemisia tridentata/Grayia spinosa* Community..... (p.16)

DDD. *Chrysothamnus nauseosus* a codominant with *Sitanion hystrix* the most abundant grass.... *Artemisia tridentata/Chrysothamnus nauseosus/Sitanion hystrix* Community..... (p.14)

BB. Communities dominated by *Atriplex confertifolia*

C. *Artemisia spinescens* and *Eurotia lanata* abundant in the shrub layer with little understory..... *Atriplex confertifolia/Artemisia spinescens/Eurotia lanata* Community..... (p.20)

CC. *Artemisia spinescens* and *Sarcobatus vermiculatus* abundant in the shrub layer with little understory.... *Atriplex confertifolia/Artemisia spinescens/ Sarcobatus vermiculatus* Community..... (p.22)

CCC. *Artemisia spinescens* abundant in the shrub layer with a *Sitanion hystrix* understory... *Atriplex confertifolia/Artemisia spinescens/ Sitanion hystrix* Community..... (p.24)

CCCC. *Bromus tectorum* the most abundant grass ... *Atriplex confertifolia/Bromus tectorum* Community..... (p.26)

BBB. Community dominated by *Chrysothamnus nauseosus*, *Sarcobatus vermiculatus* and *Artemisis tridentata* with *Distichlis stricta* the most abundant grass... *Chrysothamnus nauseosus/Sarcobatus vermiculatus/ Artemisia tridentata/Distichlis stricta* Community..... (p.28)

BBBB. Communities dominated by *Sarcobatus baileyi*

C. *Sitanion hystrix* abundant in the understory... *Sarcobatus baileyi/Sitanion hystrix* community..... (p.38)

CC. *Atriplex confertifolia* and *Artemisia spinescens* abundant in the shrub layer with little understory.. *Sarcobatus baileyi/Atriplex confertifolia/Artemisia spinescens* Community ..... (p.36)

BBBBB. Community dominated by *Poa nevadensis* *Poa nevadensis/Carex* sp. Community..... (p.34)

Low Sagebrush *(Artemisia arbuscula)* Community

1. *Artemisia arbuscula/Poa secunda* Community

This community has developed in the southwest part of the watershed, usually on steep north facing mountain slopes.

The community occurs on north facing slopes of 45 percent, elevation is around 5550 feet, and mean annual precipitation is 8.0 inches. Average vegetation cover is 24.7 percent.

Low sagebrush *(Artemisia arbuscula)* is the dominant species with 6.5 percent cover and 46.0 percent frequency. Slenderbush eriogonum *(Eriogonum microthecum)*, yellowbrush *(Chrysothamnus viscidiflorus)* and rubber rabbitbrush *(Chrysothamnus nauseosus)* occur with 35.5, 2.5 and 0.5 percent frequency, respectively.

Sandberg bluegrass *(Poa secunda)* and squirreltail *(Sitanion hystrix)* are the most abundant grasses. Respectively, they have cover percentages of 11.4 and 1.0, and frequency values of 96.5 and 36.5 percent. Idaho fescue *(Festuca idahoensis)* occurs with 11.0 percent frequency.

Phlox diffusa, stemless goldenweed *(Haplopappus acaulis)*, longleaf phlox *(Phlox longifolia)* and *Erigeron* sp. occur with 88.5, 23.5,22.5 and 21.5 percent frequency, respectively. *Phlox diffusa* and stemless goldenweed account for 2.6 and 1.7 percent cover, respectively. A number of additional forbs occur with frequency values of 11.0 percent and less (Table 1). This community is a seral representative of an *Artemisia arbuscula/Festuca idahoensis* habitat-type.

Pavement accounts for 59.0 percent of the ground cover characteristics, bare ground for 18.0 percent, rock for 14.0 percent, and litter for 8.5 percent (Table 2).

The soil at the macroplot where this community was sampled is a member of a coarse-loamy, mixed, mesic, shallow family of Entic Haploxerolls (Appendix B-26).

Table 1. Species Cover and Frequency for the *Artemisia arbuscula/Poa secunda* Community.

Species	Cover %	20 x 20* Frequency %
Artemisia arbuscula	6.5	46.0
Eriogonum microthecum		35.5
Chrysothamnus viscidiflorus		2.5
Chrysothamnus nauseosus		0.5
Poa secunda	11.4	96.5
Sitanion hystrix	1.0	36.5
Festuca idahoensis		11.0
Phlox diffusa	2.6	88.5
Haplopappus acaulis	1.7	23.5
Phlox longifolia		22.5
Erigeron sp.		21.5
Crepis acuminata		11.0
Lygodesmia spinosa		9.5
Astragalus purshii		4.0
Phlox sp.		3.5
Erigeron pumilus		1.5
Lupinus caudatus		1.0
Arabis holboellii		t**
Agoseris glauca		t
Total cover of all species	24.7	

* Frame size in inches
** Trace

Table 2. Ground Cover Characteristics for the *Artemisia arbuscula/Poa secunda* Community

Material	Cover %
Bare ground	18.0
Litter	8.5
Pavement	59.0
Rock	14.0

Big Sagebrush *(Artemisia tridentata)* Communities

1. *Artemisia tridentata/Chrysothamnus nauseosus/ Sitanion hystrix* Community.

This community occurs in the southwest part of Cow Creek Wash. It is usually bordered by the *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* community and alternates with the *Chrysothamnus nauseosus/Sarcobatus vermiculatus/Artemisia tridentata/ Distichlis stricta* community.

The community is found on northeast facing fans and drainage bottoms with 2 to 4 percent slope, elevation is around 5100 feet, and the mean annual precipitation is 7.5 inches. Average vegetation cover is 21.0 percent.

Big sagebrush *(Artemisia tridentata)* and rubber rabbitbrush *(Chrysothamnus nauseosus)* are co-dominant with 9.0 and 5.9 percent cover, and 74.0 and 42.5 percent frequency, respectively. Yellow-brush *(Chrysothamnus viscidiflorus)* occurs with 4.0 percent cover and 25.5 percent frequency. Mormon tea *(Ephedra nevadensis)* and littleleaf horsebrush *(Tetradymia glabrata)* are scarce.

Squirreltail *(Sitanion hystrix)* is the most abundant grass with 1.1 percent cover and 59.0 percent frequency. Cheatgrass *(Bromus tectorum)* and Sandberg bluegrass *(Poa secunda)* occur with 14.0 and 10.0 percent frequency, respectively. Great Basin wildrye *(Elymus cinereus)* and crested wheatgrass *(Agropyron desertorum)* are infrequent.

Clasping pepperweed *(Lepidium perfoliatum)* and pinnate tansymustard *(Descurainia pinnata)* are the most frequent forbs in the community (12.0 and 8.0 percent, respectively). A few additional forbs occur in small amounts (Table 3). This community is probably a seral representative of an *Artemisia tridentata/Elymus cinereus* habitat-type.

Litter accounts for 36.5 percent of the ground cover characteristics, bare ground for 34.5 percent, pavement for 27.5 percent, and rock for 1.5 percent (Table 4).

The soil at the macroplot where this community was described is a member of a fine, mixed, mesic family of Mollic Haplargids (Appendix B-11).

Table 3. Species Cover and Frequency for the *Artemisia tridentata/Chrysothamnus nauseosus/Sitanion hystrix* Community

Species	Cover %	30 x 30* Frequency %
Artemisia tridentata	9.0	74.0
Chrysothamnus nauseosus	5.9	42.5
Chrysothamnus viscidiflorus	4.0	25.5
Ephedra nevadensis		2.0
Tetradymia glabrata		t**
Sitanion hystrix	1.1	59.0
Bromus tectorum		14.0
Poa secunda		10.0
Elymus cinereus		3.5
Agropyron desertorum		1.0
Lepidium perfoliatum		12.0
Descurainia pinnata		8.0
Iva axillaris		2.5
Lygodesmia spinosa		1.0
Total cover of all species	21.0	

* Frame size in inches
** Trace

Table 4. Ground Cover Characteristics for the *Artemisia tridentata/Chrysothamnus nauseosus/Sitanion hystrix* Community

Material	Cover %
Bare ground	34.5
Litter	36.5
Pavement	27.5
Rock	1.5

2. *Artemisia tridentata/Grayia spinosa* Community

This community is encountered mostly as alternes with the *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* and *Sarcobatus baileyi/Atriplex confertifolia/Artemisia spinescens* communities.

The community occurs in northwest facing drainage bottoms with 2 percent slope, elevation is around 4880 feet, and the mean annual precipitation is 6.7 inches. Average vegetation cover is 11.0 percent.

Big sagebrush *(Artemisia tridentata)* and spiny hopsage *(Grayia spinosa)* are codominants with 5.2 and 3.3 percent cover, and 31.0 and 27.5 percent frequency. Bud sagebrush *(Artemisia spinescens)* and yellowbrush *(Chrysothamnus viscidiflorus)* occur in lesser amounts (1.1 and 0.9 percent cover, and 10.5 and 13.0 percent frequency, respectively). A few additional shrubs are found with frequency values that range from a trace to 14.5 percent.

Squirreltail *(Sitanion hystrix)* is the most abundant grass (0.2 percent cover and 5.5 percent frequency). Cheatgrass *(Bromus tectorum)* and Indian ricegrass *(Oryzopsis hymenoides)* however, occur with 3.5 and 3.0 percent frequency, respectively.

Pinnate tansymustard *(Descurainia pinnata)* occurs with 2.5 percent frequency. Additional forbs are found with trace frequency values (Table 5). This community is probably a seral representative of an *Artemisia tridentata/Grayia spinosa/Oryzopsis hymenoides* habitat-type.

Litter accounts for 40.0 percent of the ground cover characteristics, pavement for 33.0 percent, bare ground for 20.0 percent, rock for 4.0 percent and lichen for 3.0 percent (Table 6).

The soil at the macroplot where this community was described is a member of a coarse-loamy, mixed, mesic family of Mollic Haplargids (Appendix B-13).

Table 5. Species Cover and Frequency for the *Artemisia tridentata/Grayia spinosa* Community

Species	Cover %	30 x 30* Frequency %
Artemisia tridentata	5.2	31.0
Grayia spinosa	3.3	27.5
Artemisia spinescens	1.1	10.5
Chrysothamnus viscidiflorus	0.9	13.0
Atriplex confertifolia		14.5
Sarcobatus baileyi		1.5
Eurotia lanata		t**
Tetradymia glabrata		t
Sitanion hystrix	0.2	5.5
Bromus tectorum		3.5
Oryzopsis hymenoides		3.0
Descurainia pinnata		2.5
Eriogonum sp.		t
Mentzelia multiflora		t
Sphaeralcea grossulariaefolia		t
Total cover of all species	11.0	

* Frame size in inches
** Trace

Table 6. Ground Cover Characteristics for the *Artemisia tridentata/Grayia sponosa* Community

Material	Cover %
Bare ground	20.0
Litter	40.0
Pavement	33.0
Rock	4.0
Lichen	3.0

3. *Artemisia tridentata/Poa secunda* Community

This community occurs in the central part of the watershed mostly as alternes with the *Atriplex confertifolia/Artemisia spinescens/ Sitanion hystrix* and *Sarcobatus baileyi/Atriplex confertifolia/Artemisia spinescens* communities. In the northern and southern part of the watershed it occurs as a pure type.

The community occurs on fans and slopes of all aspects with 2 to 45 percent slopes, the elevation ranges from 4400 to 5550 feet, and the mean annual precipitation is 7.5 inches. Average vegetation cover is 11.6 percent.

Big sagebrush *(Artemisia tridentata)* is the dominant species with 7.8 percent cover and 70.6 percent frequency. Yellowbrush *(Chrysothamnus viscidiflorus)* and littleleaf horsebrush *(Tetradymia glabrata)* occur with 80 percent constancy. Respectively, they have 3.4 and 2.0 percent frequency. Additional shrubs occur with low frequency and constancy values.

Sandberg bluegrass *(Poa secunda)*, cheatgrass *(Bromus tectorum)*, and squirreltail *(Sitanion hystrix)* have constancy ratings of 100 percent. Respectively, they occur with 0.8, 0.6 and 0.6 percent cover, and 49.7, 41.0 and 37.9 percent frequency. Additional grasses have low frequency and constancy.

Longleaf phlox *(Phlox longifolia)* is the only forb to occur in all stands sampled (100 percent constancy). *Phlox diffusa* and mat eriogonum *(Eriogonum caespitosum)* are the most abundant (0.5 and 0.3 percent cover, and 12.4 and 6.6 percent frequency), with constancy ratings of 20 percent. A number of additional forbs occur erratically through the community (Table 7). This community is probably a seral representative of an *Artemisia tridentata/Stipa thurberiana* habitat-type.

Pavement accounts for 37.0 percent of the ground cover characteristics, rock for 22.0 percent, bare ground for 20.5 percent and litter for 20.5 percent (Table 8).

The soils at the macroplots where this community was described are members of a loamy-skeletal, mixed, mesic family of Duric Mollic Camborthids (Appendix B-6); fine-loamy, mixed, mesic family of Mollic Haplargids (Appendix (B-12); fine-loamy, mixed, mesic family of Duric Mollic Haplargids (Appendix B-15); fine, mixed, mesic family of Mollic Durargids (Appendix B-18); fine, mixed, mesic family of Haplic Mollic Durargids (Appendix B-19); or loamy-skeletal, mixed, mesic family of Haplic Durixerolls (Appendix B-28).

Table 7. Species Cover, Frequency, and Constancy for the *Artemisia tridentata/Poa secunda* Community

Species	Cover %	30 x 30* Frequency %	Constancy
Artemisia tridentata	7.8	70.6	100
Chrysothamnus viscidiflorus	0.4	3.4	80
Tetradymia glabrata		2.0	80
Chrysothamnus viscidiflorus var. *puberulus*		1.8	20
Grayia spinosa			40
Ephedra viridis			20
Poa secunda	0.8	49.7	100
Bromus tectorum	0.6	41.0	100
Sitanion hystrix	0.6	37.9	100
Stipa thurberiana		1.2	40
Agropyron spicatum			20
Phlox diffusa	0.5	12.4	20
Eriogonum caespitosum	0.3	6.6	20
Descurainia pinnata		4.2	60
Balsamorhiza hookeri		3.8	40
Astragalus sp.		2.9	80
Crepis acuminata		2.2	60
Phlox longifolia		2.0	100
Lupinus caudatus		1.2	40
Eriogonum sp.		1.1	40
Caulanthus crassicaulis			40
Eriogonum purshii			20
Balsamorhiza sagittata			20
Chaenactis douglasii			20
Lepidium perfoliatum			20
Penestamon sp.			20
Sphaeralcea coccinea			20
Zigadenus paniculatus			20
Total cover of all species	11.6		

* Frame size in inches

Table 8. Ground Cover Characteristics for the *Artemisia tridentata/Poa secunda* Community

Material	Cover %
Bare ground	20.5
Litter	20.5
Pavement	37.0
Rock	22.0

Shadscale *(Atriplex confertifolia)* Communities

1. *Atriplex confertifolia/Artemisia spinescens/ Eurotia lanata* Community

This community has developed in the central part of the watershed and usually occurs north and south of the *Atriplex confertifolia/ Artemisia spinescens/Sarcobatus vermiculatus* community.

The community is found on south and east facing drainage bottoms and fans with 2 to 3 percent slope, elevation ranges from 4350 to 4400 feet, and the mean annual precipitation is 6.2 inches. Average vegetation cover is 6.9 percent.

Shadscale *(Atriplex confertifolia)*, bud sagebrush *(Artemisia spinescens)*, and winterfat *(Eurotia lanata)* are the dominant species. Respectively, they occur with 3.9, 2.5 and 0.5 percent cover, and 56.0, 47.5 and 14.8 percent frequency. Additional shrubs occur erratically and in small amounts.

Cheatgrass *(Bromus tectorum)* and squirreltail *(Sitanion hystrix)* are the most frequent grasses (4.8 and 4.2 percent, respectively), with Indian ricegrass *(Oryzopsis hymenoides)* in trace amounts.

Halogeton *(Halogeton glomeratus)*, desert mentzelia *(Mentzelia multiflora)* and gooseberryleaf globemallow *(Sphaeralcea grossulariaefolia)* are the most frequent forbs with 3.5, 3.5 and 3.2 percent, respectively. Additional forbs, when present, occur with small frequency values (Table 9). This community is probably an *Atriplex confertifolia/ Artemisia spinescens/Eurotia lanata/Oryzposis hymenoides* habitat-type.

Bare ground accounts for 35.5 percent of the ground cover characteristics, litter for 24.8 percent; lichen for 22.8 percent, pavement for 16.7 percent, and rock for 0.2 percent (Table 10).

The soils at the macroplots where this community was sampled are members of a coarse-loamy, mixed, mesic family of Typic Camborthids (Appendix B-5); or fine, mixed, mesic family of Duric Haplargids (Appendix B-14).

Table 9. Species Cover, Frequency, and Constancy for the *Atriplex confertifolia/Artemisia spinescens/ Eurotia lanata* Community

Species	Cover %	30 x 30* Frequency %	Constancy
Atriplex confertifolia	3.9	56.0	100
Artemisia spinescens	2.5	47.5	100
Eurotia lanata	0.5	14.8	100
Ephedra viridis			50
Sarcobatus vermiculatus			50
Tetradymia glabrata			50
Bromus tectorum		4.8	100
Sitanion hystrix		4.2	100
Oryzopsis hymenoides			50
Halogeton glomeratus		3.5	100
Mentzelia multiflora		3.5	50
Sphaeralcea grossulariaefolia		3.2	100
Descurainia pinnata		1.2	50
Stanleya pinnata		1.0	100
Lepidium perfoliatum			100
Chaenactis douglasii			50
Oenothera sp.			50
Salsola kali var. *tenuifolia*			50
Total cover of all species	6.9		

* Frame size in inches

Table 10. Ground Cover Characteristics for the *Atriplex confertifolia/Artemisia spinescens/ Eurotia lanata* Community

Material	Cover %
Bare ground	35.5
Litter	24.8
Pavement	16.7
Rock	0.2
Lichen	22.8

2. *Atriplex confertifolia/Artemisia spinescens/ Sarcobatus vermiculatus* Community

This community has developed in the northwest part of the watershed in the main wash.

The community occurs on southwest facing drainage bottoms with 2 percent slope, elevation is around 4300 feet, and the mean annual precipitation is 6.8 inches. Average vegetation cover is 6.8 percent.

Shadscale *(Atriplex confertifolia)*, bud sagebrush *(Artemisia spinescens)*, and black greasewood *(Sarcobatus vermiculatus)* are the dominant species. Respectively, they occur with 3.2, 2.9 and 0.5 percent cover, and 38.5, 34.5 and 14.0 percent frequency. Cottonthorn horsebrush *(Tetradymia spinosa)* is present in trace amounts.

Squirreltail *(Sitanion hystrix)*, the only grass, occurs in trace amounts. Pinnate tansymustard *(Descurainia pinnata)* and clasping pepperweed *(Lepidium perfoliatum)* are the most frequent forbs (6.0 and 3.0 percent). A few additional forbs occur in small amounts (Table 11). This community is probably an *Atriplex confertifolia/ Artemisia spinescens/Sarcobatus vermiculatus* habitat-type.

Bare ground accounts for 41.5 percent of the ground cover characteristics, lichen for 37.0 percent, litter for 18.0 percent, pavement for 3.5 percent, and rock for 0.0 percent (Table 12).

The soil at the macroplot where this community was sampled is a member of a coarse-loamy, mixed, mesic family of Typic Camborthids (Appendix B-5).

Table 11. Species Cover and Frequency for the *Atriplex confertifolia/Artemisia spinescens/Sarcobatus vermiculatus* Community

Species	Cover %	30 x 30* Frequency %
Atriplex confertifolia	3.2	38.5
Artemisia spinescens	2.9	34.5
Sarcobatus vermiculatus	0.5	14.0
Tetradymia spinosa		t**
Sitanion hystrix		t
Descurainia pinnata		6.0
Lepidium perfoliatum		3.0
Oenothera sp.		1.0
Mentzelia multiflora		t
Total cover of all species	6.8	

* Frame size in inches
** Trace

Table 12. Ground Cover Characteristics for the *Atriplex confertifolia/Artemisia spinescens/Sarcobatus vermiculatus* Community

Material	Cover %
Bare ground	41.5
Litter	18.0
Pavement	3.5
Rock	0.0
Lichen	37.0

3. *Atriplex confertifolia/Artemisia spinescens/ Sitanion hystrix* Community

This is the largest community found in the basin. It occurs in most parts of the watershed.

The community is found on fans, hills and mountains of all aspects with 1 to 25 percent slope, elevation ranges from 4625 to 5710 feet, and the mean annual precipitation is 6.9 inches. Average vegetation cover is 12.3 percent.

Shadscale *(Atriplex confertifolia)* and bud sagebrush *(Artemisia spinescens)* are the dominant species. They occur in all stands with an average cover of 7.6 and 3.6 percent and a frequency percent of 71.7 and 55.8, respectively. Additional shrubs are found in small amounts.

Squirreltail *(Sitanion hystrix)* is the most abundant grass (1.1 percent cover and 30.7 percent frequency). Cheatgrass *(Bromus tectorum)*, Sandberg bluegrass *(Poa secunda)*, and Indian ricegrass *(Oryzopsis hymenoides)* have constancy ratings of 20 to 80 percent and frequency percentages of a trace to 53.0 percent.

Gooseberryleaf globemallow *(Spaeralcea grossulariaefolia)* and desert mentzelia *(Mentzelia multiflora)* are the most frequent forbs with 7.2 and 3.4 percent. Respectively, they have constancy ratings of 60 and 20 percent. A few additional forbs occur with low frequency percents and constancy ratings of 20 to 40 percent (Table 13). This community is probably a seral representative of an *Atriplex confertifolia/ Artemisia spinescens/Oryzopsis hymenoides* habitat-type.

Pavement accounts for 42.0 percent of the ground cover characteristics, litter for 25.7 percent, bareground for 17.0 percent, lichen for 8.0 percent, and rock for 7.3 percent (Table 14).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, mesic family of Typic Camborthids (Appendix B-4); coarse-loamy, mixed, mesic family of Typic Durorthids (Appendix B-7); clayey-skeletal, mixed, mesic family of Typic Haplargids (Appendix B-8); fine, mixed, mesic family of Haplic Durargids (Appendix B-17); fine, montmoillonitic, mesic family of Typic Natrargids (Appendix B-21); fine, montmoillonitic, mesic family of Duric Natrargids (Appendix B-22); or fine, montmoillonitic, mesic family of Typic Nadurargids (Appendix B-23).

Table 13. Species Cover, Frequency and Constancy for the *Atriplex confertifolia/Artemisia spinescens/ Sitanion hystrix* Community

Species	Cover %	30 x 30* Frequency%	Constancy
Atriplex confertifolia	7.6	71.7	100
Artemisia spinescens	3.6	55.8	100
Artemisia tridentata			40
Chrysothamnus viscidiflorus			20
Opuntia ramosissima			20
Sitanion hystrix	1.1	30.7	100
Bromus tectorum		53.0	80
Poa secunda		7.3	40
Oryzopsis hymenoides			20
Sphaeralcea grossulariaefolia		7.2	60
Mentzelia multiflora		3.4	20
Descurainia pinnata		1.4	40
Lepidium perfoliatum		1.3	20
Caulanthus crassicaulis			20
Phlox longifolia			20
Total cover of all species	12.3		

* Frame size in inches

Table 14. Ground Cover Characteristics for the *Atriplex confertifolia/Artemisia spinescens/ Sitanion hystrix* Community

Material	Cover %
Bare ground	17.0
Litter	25.7
Pavement	42.0
Rock	7.3
Lichen	8.0

4. *Atriplex confertifolia/Bromus tectorum* Community

This community has developed in small areas mostly in the central part of the watershed.

The community occurs on north, east and west facing slopes and fans with 1 to 30 percent slope, elevation ranges from 4320 to 4830 feet, and the mean annual precipitation is 6.7 inches. Average vegetation cover is 9.4 percent.

Shadscale *(Atriplex confertifolia)* is the dominant species with 8.0 percent cover and 64.0 percent frequency. A number of additional shrubs occur with small frequency values (trace to 1.5 percent).

Cheatgrass *(Bromus tectorum)* and squirreltail *(Sitanion hystrix)* are the most abundant grasses (0.5 and 0.1 percent frequency). Indian ricegrass *(Oryzopsis hymenoides)* occurs with 2.0 percent frequency.

Pinnate tansymustard *(Descurainia pinnata)* is the most abundant forb with 0.7 percent cover and 42.0 percent frequency. Other forbs occur with 1.5 percent or less frequency (Table 15). This community is probably a seral representative of an *Atriplex confertifolia/ Oryzopsis hymenoides* habitat-type.

Litter accounts for 37.0 percent of the ground cover characteristics, bare ground for 32.5 percent, pavement for 20.5 percent, rock for 5.0 percent, and lichen for 5.0 percent (Table 16).

The soils at the macroplots where this community was sampled are members of a coarse-loamy, mixed, mesic family of Typic Durargids (Appendix B-7); fine-loamy, mixed, mesic family of Typic Durargids (Appendix B-16); very-fine, montmorillonitic mesic family of Typic Natrargids (Appendix B-20); or fine, montmorillonitic, mesic family of Typic Natrargids (Appendix B-21).

Table 15. Species Cover and Frequency for the *Atriplex confertifolia/Bromus tectorum* Community

Species	Cover %	30 x 30* Frequency %
Atriplex confertifolia	8.0	64.0
Artemisia spinescens		1.5
Ephedra nevadensis		1.5
Artemisia tridentata		1.0
Grayia spinosa		1.0
Eurotia lanata		t**
Sarcobatus baileyi		t
Tetradymia glabrata		t
Bromus tectorum	0.5	33.0
Sitanion hystrix	0.1	11.0
Oryzopsis hymenoides		2.0
Descurainia pinnata	0.7	42.0
Mentzelia multiflora		1.5
Sphaeralcea grossulariaefolia		1.0
Halogeton glomeratus		t
Total cover of all species	9.5	

* Frame size in inches
** Trace

Table 16. Ground Cover Characteristics for the *Atriplex confertifolia/Bromus tectorum* Community

Material	Cover %
Bare ground	32.5
Litter	37.0
Pavement	20.5
Rock	5.0
Lichen	5.0

Rubber Rabbitbrush *(Chrysothamnus nauseosus)* Communities

1. *Chrysothamnus nauseosus/Sarcobatus vermiculatus/ Artemisia tridentata/Distichlis stricta* Community

This community occurs in the southwest part of Cow Creek Wash. It is usually bordered by the *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* community and alternates with the *Artemisia tridentata/Chrysothamnus nauseosus/Sitanion hystrix* community.

The community is found on northeast facing drainage bottoms with 2 to 4 percent slope, elevation is around 5025 feet, and the mean annual precipitation is 7.0 inches. Average vegetation cover is 26.8 percent.

Rubber rabbitbrush *(Chrysothamnus nauseosus)*, black greasewood *(Sarcobatus vermiculatus)* and big sagebrush *(Artemisia tridentata)* are codominants. Respectively, they occur with 10.2, 8.6 and 4.6 percent cover, and 25.5, 21.0 and 43.0 percent frequency. A number of additional shrubs occur with low cover and frequency.

Saltgrass *(Distichlis stricta)* and cheatgrass *(Bromus tectorum)* are the most abundant grasses with 1.4 and trace percent cover, and 65.5 and 43.0 percent frequency. A number of other grasses occur with frequency values of trace to 15.0 percent. Sedge *(Carex* sp.) occurs with 1.0 percent frequency.

Poverty sumpweed *(Iva axillaris)* and pinnate tansymustard *(Descurainia pinnata)* are found with 8.5 and 6.0 percent frequency, respectively (Table 17). This community is probably a seral representative of a *Sarcobatus vermiculatus/Artemisia tridentata/Elymus cinereus* habitat-type.

Bare ground accounts for 53.0 percent of the ground cover characteristics, litter for 37.0 percent, rock for 5.5 percent, and pavement for 4.5 percent (Table 18).

The soil at the macroplot where this community was sampled is a member of a sandy-skeletal, mixed, mesic family of Typic Torrifluvents (Appendix B-3).

Table 17. Species Cover and Frequency for the *Chrysothamnus nauseosus/Sarcobatus vermiculatus/Artemisia tridentata/Distichlis stricta* Community

Species	Cover %	30 x 30* Frequency %
Chrysothamnus nauseosus	10.2	25.5
Sarcobatus vermiculatus	8.6	21.0
Artemisia tridentata	4.6	43.0
Chrysothamnus viscidiflorus	1.0	3.0
Artemisia spinescens		2.5
Atriplex confertifolia		2.5
Grayia spinosa		t**
Distichlis stricta	1.4	65.5
Bromus tectorum	t	43.0
Sitanion hystrix		15.0
Elymus cinereus		8.5
Poa secunda		7.5
Agropyron desertorum		1.5
Poa nevadensis		t
Carex sp.		1.0
Iva axillaris		8.5
Descurainia pinnata		6.0
Total cover of all species	26.8	

* Frame size in inches
** Trace

Table 18. Ground Cover Characteristics for the *Chrysothamnus nauseosus/Sarcobatus vermiculatus/Artemisia tridentata/Distichlis stricta* Community

Material	Cover %
Bare ground	53.0
Litter	37.0
Pavement	4.5
Rock	5.5

Juniper *(Juniperus osteosperma)* Communities

1. *Juniperus osteosperma/Artemisia arbuscula/Poa secunda* Community

This community has developed on the southwest rim of the basin. It is usually bordered by the *Artemisia tridentata/Poa secunda* community.

The community usually occurs on north and east facing slopes of 22 percent, elevation is around 5900 feet and the mean annual precipitation is 8.0 inches. Average vegetation cover is 24.9 percent.

Juniper *(Juniperus osteosperma)* is the dominant species with a density of 70 trees per acre and 3.0 percent cover. Most of the trees are in maturity class 1 (45 trees per acre) indicating that juniper is increasing. The larger trees (maturity class 3 and 4), however, are exerting the most influence on the understory and account for most of the cover with 1.0 and 1.5 percent, respectively.

Low sagebrush *(Artemisia arbuscula)* is dominant in the shrub layer (15.2 percent cover and 79.0 percent frequency). Slenderbrush eriogonum *(Eriogonum microthecum)*, yellowbrush *(Chrysothamnus viscidiflorus)* and rubber rabbitbrush *(Chrysothamnus nauseosus)* occur with small frequency (0.5 and 8.0 percent).

Sandberg bluegrass *(Poa secunda)* and squirreltail *(Sitanion hystrix)* occur with 3.9 and 1.0 percent cover, and 96.0 and 28.5 percent frequency, respectively. Webbers needlegrass *(Oryzopsis webberi)* is found with a small frequency percent.

Longleaf phlox *(Phlox longifolia)* is the most frequent forb with 62.5 percent. A number of other forbs occur with smaller frequency values (1.0 to 18.0 percent)(Table 19). This community is probably a *Juniperus osteosperma/Artemisia arbuscula/Oryzopsis webberi* habitat-type.

Bare ground accounts for 34.0 percent of the ground cover characteristics, pavement for 29.5 percent, litter for 23.5 percent, and rock for 13.0 percent (Table 20).

The soil at the macroplot where this community was sampled is a member of a very-fine, montmorillonitic, mesic family of Abruptic Durixerolls (Appendix B-27).

Table 19. Species Density, Cover and Frequency for the *Juniperus osteosperma/Artemisia arbuscula/Poa secunda* Community

Species	Mean Density (trees/acre) by Maturity Class				
	1	2	3	4	Total
Juniperus osteosperma	45	10	10	5	70

	Mean Cover Percent by Maturity Class				
	1	2	3	4	Total
Juniperus osteosperma	0.2	0.3	1.0	1.5	3.0

Mean Cover and Frequency of Non-tree Species

Species	Cover %	20 x 20* Frequency %
Artemisia arbuscula	15.2	79.0
Eriogonum microthecum		8.0
Chrysothamnus viscidiflorus		5.0
Chrysothamnus nauseosus		0.5
Poa secunda	3.9	96.0
Sitanion hystrix	1.0	28.5
Oryzopsis webberi		3.5
Phlox longifolia		62.5
Lupinus caudatus		18.0
Phlox diffusa		14.5
Eriogonum sp.		8.5
Crepis acuminata		7.0
Artennaria dimorpha		5.5
Astragalus sp.		1.0
Astragalus purshii		1.0
Total cover of all species	24.9	

*Frame size in inches

Table 20. Ground Cover Characteristics for the *Juniperus osteosperma/Artemisia arbuscula/Poa secunda* Community

Material	Cover %
Bare ground	34.0
Litter	23.5
Pavement	29.5
Rock	13.0

2. *Juniperus osteosperma/Artemisia tridentata/ Poa secunda* Community

This community occurs on the east and southwest rim of the watershed. It is usually bordered by the *Artemisia tridentata/Poa secunda* community.

The community occurs at the lower elevations on north and northwest facing slopes, but at the higher elevations it is also found on south and west facing slopes of 25 percent. The elevation is around 5200 feet and the mean annual precipitation is 7.1 inches. Average vegetation cover is 25.5 percent.

Juniper *(Juniperus osteosperma)* occurs with an average density of 85 trees per acre and 11.4 percent cover. The junipers are found mostly in maturity class 4 with small equal numbers in maturity classes 1, 2 and 3, indicating an old stagnated stand of juniper.

Big sagebrush *(Artemisia tridentata)* occurs with 4.9 percent cover and 56.6 percent frequency. Littleleaf horsebrush *(Tetradymia glabrata)* is found with a small frequency value (0.5 percent).

Sandberg bluegrass *(Poa secunda)* and squirreltail *(Sitanion hystrix)* are the most abundant grasses. Respectively, they occur with 2.8 and 2.5 percent cover, and 70.0 and 64.0 percent frequency. Cheatgrass *(Bromus tectorum)* and Thurbers needlegrass *(Stipa thurberiana)* occur with lower frequency percents (22.0 and 1.5, respectively).

Phlox diffusa is the most abundant forb (3.4 percent cover and 41.0 percent frequency). Additional forbs occur with small frequency values (1.0 and 5.5 percent)(Table 21). This community is probably a low seral representative of a *Juniperus osteosperma/Artemisia tridentata/ Stipa thurberiana* habitat-type.

Litter accounts for 42.5 percent of the ground cover characteristics, bare ground for 33.0 percent, pavement for 14.5 percent and rock for 11.0 percent (Table 22).

The soil at the macroplot where this community was sampled is a member of a fine, mixed, mesic, shallow family of Typic Argixerolls (Appendix B-29).

Table 21. Species Density, Cover and Frequency for the *Juniperus osteosperma/Artemisia tridentata/ Poa secunda* Community

Species	Mean Density (trees/acre) by Maturity Class				
	1	2	3	4	Total
Juniperus osteosperma	5	5	5	70	85

	Mean Cover Percent by Maturity Class				
	1	2	3	4	Total
Juniperus osteosperma	0.01	0.1	0.7	10.6	11.4

Mean Cover and Frequency of Non-tree Species

Species	Cover %	20 x 20* Frequency %
Artemisia tridentata	4.9	56.5
Tetradymia glabrata		0.5
Poa secunda	2.8	70.0
Sitanion hystrix	2.5	64.0
Bromus tectorum		22.0
Stipa thurberiana		1.5
Phlox diffusa	3.4	41.0
Phlox longifolia		5.5
Penestomon sp.		3.0
Lupinus caudatus		2.5
Ephedra viridis		2.0
Antennaria dimorpha		1.5
Balsamorhiza hookeri		1.5
Eriogonum sp.		1.5
Astragalus sp.		1.0
Total cover of all species	25.5	

*Frame size in inches

Table 22. Ground Cover Characteristics for the *Juniperus osteosperma/Artemisia tridentata/Poa secunda* Community

Material	Cover %
Bare ground	33.0
Litter	42.5
Pavement	13.5
Rock	11.0

Nevada Bluegrass *(Poa nevadensis)* Community

1. *Poa nevadensis/Carex* sp. community

This community occurs in the southern part of the basin and is usually bordered by big sagebrush dominated communities.

The community is found in northeast and east facing drainage bottoms with 1 to 18 percent slope, elevation ranges from 5085 to 5215 feet, and the mean annual precipitation is 7.5 inches. Average vegetation cover is 81.3 percent.

A number of grasses are present in the community, however, Nevada bluegrass *(Poa nevadensis)* and *Hordeum californicum* are the most abundant with 9.0 and 6.5 percent cover, respectively. Sedge *(Carex* sp.) and baltic rush *(Juncus balticus)* occur with 7.6 and 6.2 percent cover, respectively.

Western yarrow *(Achillea lanulosa)*, common dandelion *(Taraxacum officinale)* and flixweed tansymustard *(Descurainia sophia)* occur with 11.8, 8.8 and 7.2 percent cover. Additional forbs occur with cover percent from 0.2 to 4.0 (Table 23). This community is a *Poa nevadensis/ Carex* sp. habitat-type.

Bare ground accounts for 11.4 percent of the ground cover characteristics, litter for 5.5 percent, pavement for 1.8 percent, rock for 0.0 percent and vegetation for 81.3 percent (Table 24).

The soils at the macroplots where this community was sampled are members of a fine-loamy, mixed, mesic family of Cumulic Haplaquolls (Appendix B-25).

Table 23. Species Cover for the *Poa nevadensis/Carex* sp. Community

Species	Cover %
Poa nevadensis	9.0
Hordeum californicum	6.5
Elymus triticoides	1.6
Agrostis alba	1.0
Elymus cinereus	0.2
Polypogon monspeliensis	0.1
Carex sp.	7.6
Juncus balticus	6.2
Achillea lanulosa	11.8
Taraxacum officinale	8.8
Descurainia sophia	7.2
Agoseris glauca	4.0
Iris missouriensis	3.0
Potentilla flabelliformis	2.2
Trifolium dubium	1.3
Lepidium perfoliatum	1.2
Vicia americana	0.8
Equisetum sp.	0.2
Lappula redowskii	0.2
Ranunculus cymbalaria	0.2
Total cover of all species	81.3

Table 24. Ground Cover Characteristics for the *Poa nevadensis/Carex* sp. Community

Material	Cover %
Bare ground	11.4
Litter	5.5
Pavement	1.8
Rock	0.0
Vegetation	81.3

Bailey Greasewood *(Sarcobatus baileyi)* Communities

1. *Sarcobatus baileyi/Atriplex confertifolia/ Artemisia spinescens* Community

This community has developed in the northwest part of the basin and is usually bordered by the *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* community.

The community is found on north and south facing fans and terraces with 1 to 3 percent slope, elevation ranges from 4210 to 4910 feet, and the mean annual precipitation is 6.6 inches. Average vegetation cover is 11.4 percent.

Baileys greasewood *(Sarcobatus baileyi)*, shadscale *(Atriplex confertifolia)*, and bud sagebrush *(Artemisia spinescens)* are co-dominants. Respectively, they occur with 6.3, 3.5 and 1.1 percent cover, and 38.0, 47.5 and 20.8 percent frequency. A few additional shrubs, when present, occur in small quantities.

Cheatgrass *(Bromus tectorum)* and squirreltail *(Sitanion hystrix)* occur with constancy of 67 percent and frequency of 1.8 and 1.3 percent, respectively.

Pinnate tansymustard *(Descurainia pinnata)*, halogeton *(Halogeton glomeratus)* and gooseberryleaf globemallow *(Sphaeralcea grossulariaefolia)*, when present, occur with 1.3, 1.0 and trace percent frequency, respectively (Table 25). This community is probably a representative of a *Sarcobatus baileyi/Atriplex confertifolia/Artemisia spinescens* habitat-type.

Litter accounts for 31.2 percent of the ground cover characteristics, pavement for 28.5 percent, lichen for 19.5 percent, bare ground for 15.0 percent and rock for 5.8 percent (Table 26).

The soils at the macroplots where this community was sampled are members of a coarse-loamy, mixed, mesic family of Typic Camborthids (Appendix B-5); fine, mixed, mesic family of Typic Haplargids (Appendix B-9); fine-loamy, mixed, mesic family of Typic Haplargids (Appendix B-10); or fine, montmorillonitic, mesic family of Haplic Nadurargids (Appendix B-24).

Table 25. Species Cover, Frequency, and Constancy for the *Sarcobatus baileyi/Atriplex confertifolia/ Artemisia spinescens* Community

Species	Cover %	30 x 30* Frequency %	Constancy
Sarcobatus baileyi	6.3	38.0	100
Atriplex confertifolia	3.5	47.5	100
Artemisia spinescens	1.1	20.8	100
Grayia spinosa	0.2	2.0	33
Eurotia lanata		1.0	33
Tetradymia spinosa			33
Bromus tectorum		1.8	67
Sitanion hystrix		1.3	67
Descurainia pinnata		1.3	33
Halogeton glomeratus		1.0	33
Sphaeralcea grossulariaefolia			67
Total cover of all species	11.4		

Table 26. Ground Cover Characteristics for the *Sarcobatus baileyi/Atriplex confertifolia/Artemisia spinescens* Community

Material	Cover %
Bare ground	15.0
Litter	31.2
Pavement	28.5
Rock	5.8
Lichen	19.5

2. *Sarcobatus baileyi/Sitanion hystrix* Community

This community occurs in the northwest part of the watershed and is usually bordered by the *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* or *Sarcobatus baileyi/Atriplex confertifolia/Artemisia spinescens* communities.

The community occurs on north, northwest and west facing slopes of 4 to 8 percent, elevation ranges from 4900 to 4930 feet, and the mean annual precipitation is 6.8 inches. Average vegetation cover is 12.6 percent.

Bailey greasewood *(Sarcobatus baileyi)* is the dominant species with 6.1 percent cover and 35.5 percent frequency. A number of other shrubs are found with trace to 1.8 percent cover and 2.0 to 20.0 percent frequency.

Squirreltail *(Sitanion hystrix)* and Indian ricegrass *(Oryzopsis hymenoides)* occur with 0.5 percent cover and 22.5 and 10.0 percent frequency, respectively. Cheatgrass *(Bromus tectorum)* occurs with 4.5 percent frequency.

Pinnate tansymustard *(Descurainia pinnata)* is the only forb found in the community. It occurs with 11.0 percent frequency (Table 27). This community is probably a seral representative of a *Sarcobatus baileyi/Oryzopsis hymenoides* habitat-type.

Bare ground accounts for 41.0 percent of the ground cover characteristics, pavement for 32.0 percent, litter for 24.0 percent, lichen for 3.0 percent and rock for 0.0 percent (Table 28).

The soils at the macroplot where this community was sampled are members of a sandy, mixed, mesic, shallow family of Typic Torripsamments (Appendix B-1); sandy-skeletal, mixed, mesic family of Typic Torripsamments (Appendix B-2); or fine-loamy, mixed, mesic family of Typic Haplargids (Appendix B-10).

Table 27. Species Cover and Frequency for the *Sarcobatus baileyi/Sitanion hystrix* Community

Species	Cover %	30 x 30* Frequency %
Sarcobatus baileyi	6.1	35.5
Tetradymia glabrata	1.8	10.0
Chrysothamnus viscidiflorus	1.2	13.5
Artemisia tridentata	1.1	2.5
Grayia spinosa	1.0	20.0
Ephedra nevadensis	0.2	12.5
Artemisia spinescens	0.1	8.5
Eurotia lanata		2.0
Sitanion hystrix	0.5	22.5
Oryzopsis hymenoides	0.5	10.0
Bromus tectorum		4.5
Descurainia pinnata		11.0
Total cover of all species	12.6	

Table 28. Ground Cover Characteristics for the *Sarcobatus baileyi/Sitanion hystrix* Community

Material	Cover %
Bare ground	41.0
Litter	24.0
Pavement	32.0
Rock	0.0
Lichen	3.0

DISCUSSION

Management Areas

Livestock grazing in most communities has been associated with a reduction of the more palatable grass species and the invasion or increase of undesirable plants. The result has been an apparent decrease in cover and frequency of most of the more desirable forage species.

In an attempt to improve the condition of the Cow Creek Watershed as well as livestock and wildlife production, the Bureau of Land Management has regulated cattle numbers and season of grazing use. Springs have been developed to enable better livestock distribution. The basin is within two grazing units, the Seven Troughs-Rosebud, and the Rye Patch. Approximately 6,000 sheep graze the general area from December 11 to February 28 of each year, and 300-400 head of cattle from April 15 to December 31 of each year.

Range Rehabilitation and Improvement: Precipitation on the watershed is too low for traditional land improvement practices. However, for better distribution of livestock and chukar additional water developments are recommended. '

Management by Grazing: General improvement of the Cow Creek Watershed can be accomplished through a grazing management system such as rest-rotation or deferred-rotation.

Ecological Interpretations.

The *Sarcobatus baileyi/Atriplex confertifolia/Artemisia spinescens*, and some of the *Poa nevadensis/Carex* sp. meadows are in near pristine condition, while all other communities are seral. These communities and their associated soil families are presented in Appendix C.

In the southwest part of Cow Creek Watershed on steep north facing slopes, the *Artemisia arbuscula/Poa secunda* community occurs. It has developed on soils with a 14-inch mollic epipedon over a massive, gravelly, silty clay loam C1 horizon and paralithic contact within 20-inches of the soil surface. This community is a seral representative of an *Artemisia arbuscula/Festuca idahoensis* habitat-type.

The *Artemisia tridentata/Chrysothamnus nauseosus/Sitanion hystrix* community is found in the southwest part of Cor Creek Wash, on northeast facing fans and drainage bottoms with 2 to 4 percent slopes. It occurs on soils with a 9-inch ochric epipedon over a strong medium subangular blocky, fine gravelly clay argillic horizon. This community is probably a seral representative of an *Artemisia tridentata/Elymus cinereus* habitat-type.

In the central part of the watershed in northwest flowing drainage bottoms with 2 percent slope the *Artemisia tridentata/Grayia spinosa* community is encountered. It is found on soils with a 4-inch ochric epipedon over a weak medium prismatic, sandy clay loam argillic horizon. This community is probably a seral representative of an *Artemisia tridentata/Grayia spinosa/Oryzopsis hymenoides* habitat-type.

On fans and slopes of all aspects with 2 to 45 percent slope in the central part of the watershed the *Artemisia tridentata/Poa secunda* community is located. This community occurs on a number of soils with a wide range of characteristics. They are: a 5-inch ochric epipedon over a massive, very gravelly fine sandy loam cambic horizon, with durinodes within 14-inches of the surface; a 6-inch ochric epipedon over a moderate fine prismatic, gravelly clay loam argillic horizon; an 8-inch ochric epipedon over a moderate medium subangular blocky, loam argillic horizon, and durinodes within 21-inches of the soil surface; a 2- to 6-inch ochric epipedon over a moderate medium angular blocky, clay argillic horizon, and a duripan within 11- to 21-inches of the surface; a 4-inch ochric epipedon over a strong medium angular blocky, gravelly clay argillic horizon, with a weakly cemented duripan within 16-inches of the soil surface; an 8-inch mollic epipedon over a massive, very gravelly sandy loam cambic horizon, and a weakly cemented duripan within 22-inches of the soil surface. This community is probably a seral representative of an *Artemisia tridentata/Stipa thurberiana* habitat-type.

The *Atriplex confertifolia/Artemisia spinescens/Eurotia lanata* community has developed in the central part of the watershed on south and east facing drainage bottoms and fans with 2 to 3 percent slope. It occurs on soils with a 9-inch ochric epipedon over a moderate medium platy, silt loam cambic horizon; and a 3-inch ochric epipedon over a weak fine subangular blocky, clay argillic horizon and durinodes within 14-inches of the surface. This community is probably a seral representative of an *Atriplex confertifolia/Artemisia spinescens/Eurotia lanata/Oryzopsis hymenoides* habitat-type.

The *Atriplex confertifolia/Artemisia spinescens/Sarcobatus vermiculatus* community is encountered in the northwest part of the watershed on southwest facing drainage bottoms with 2 percent slope. It occurs on soils with a 9-inch ochric epipedon over a moderate medium platy, silt loam cambic horizon. This community is probably an *Atriplex confertifolia/Artemisia spinescens/Sarcobatus vermiculatus* habitat-type.

The *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* community occurs in most parts of the watershed on fans, hills and mounds of all aspects with 1 to 25 percent slope. This community is found on a number of different soils. They are characterized as follows: a 7-inch ochric epipedon over a massive, very gravelly fine sandy loam cambic horizon; a 5-to 6-inch ochric epipedon over a weak coarse prismatic, silt loam cambic horizon, and an indurated duripan within 17-inches of the surface; a 3-inch ochric epipedon over a moderate medium subangular blocky, gravelly clay loam argillic horizon; a 7-inch ochric epipedon over a weak fine subangular blocky, clay argillic horizon, and a strongly cemented duripan within 15-inches of the soil surface; a 2-to 5-inch ochric epipedon over a moderate medium prismatic, clay natric horizon; a 7-inch ochric epipedon over a medium moderate prismatic, clay natric horizon and durinodes with 24-inches of the surface; and a 7-inch ochric epipedon over a moderate medium prismatic, gravelly clay natric horizon, and an indurated duripan within 13-inches of the soil surface. This community is probably a seral representative of an *Atriplex confertifolia/Artemisia spinescens/ Oryzopsis hymenoides* habitat-type and is the climatic climax.

In most of the central part of the watershed on north, east and west facing slopes and fans with 1 to 30 percent slope the *Atriplex confertifolia/Bromus tectorum* community has developed. It occurs on soils with a 5-to 6-inch ochric epipedon over a weak coarse prismatic, silt loam cambic horizon, and an indurated duripan within 17-inches of the surface; a 5-inch ochric epipedon over a strong fine prismatic, clay loam argillic horizon, and an indurated duripan within 13-inches of the soil surface; a 6-inch ochric epipedon over a strong fine columnar, heavy clay natric horizon, with weathered bedrock within 23-inches of the soil surface;and a 2-to 5-inch ochric epipedon over a moderate medium prismatic, clay natric horizon. This community is probably a seral representative of an *Atriplex confertifolia/Oryzopsis hymenoides* habitat-type.

In the southwest part of Cow Creek Wash with 2 to 4 percent slope the *Chrysothamnus nauseosus/Sarcobatus vermiculatus/Artemisia tridentata/Distichlis stricta* community has developed. It is found on soils with a 17-inch ochric epipedon over massive, very gravelly loamy sand IICl horizon. This community is probably a *Sarcobatus vermiculatus/Artemisia tridentata/Elymus cinereus* habitat-type.

The *Juniperus osteosperma/Artemisia arbuscula/Poa secunda* community is located on the southwest rim of the basin with north and east facing slopes of 22 percent. It occurs on soils with a 12-inch mollic epipedon over a weak medium platy, gravelly heavy clay B2t argillic horizon, and an indurated duripan with 23-inches of the soil surface. This community is probably a seral representative of a *Juniperus osteosperma/Artemisia arbuscula/Oryzopsis webberi* habitat-type.

The *Juniperus osteosperma/Artemisia tridentata/Poa secunda* community occurs on the east and southwest rim of the basin on north, northwest, west and south facing slopes of 25 percent. It is found on soils with a 10-inch mollic epipedon over, and in conjunction with, a 10-inch massive, gravelly clay argillic horizon, and paralithic contact within 14 inches of the soil surface. This community is probably a seral representative of a *Juniperus osteosperma/Artemisia tridentata/Stipa thurberiana* habitat-type.

In the southern part of the watershed on northeast and east facing drainage bottoms with 1 to 18 percent slope the *Poa nevadensis /Carex* sp. community is found. The meadows occur on soils with a 38-inch plus mollic epipedon with a high watertable and a few mottles within 17 inches of the soil surface. This community is a *Poa nevadensis/Carex* sp. habitat-type.

The *Sarcobatus baileyi/Atriplex confertifolia/Artemisia spinescens* community has developed in the northwest part of the watershed on north and south facing fans and terraces with 1 to 3 percent slope. This community occurs on soils with a 9-inch ochric epipedon over a moderate medium platy, silt loam cambic horizon; a 5-inch ochric epipedon over a moderate medium subangular blocky, clay argillic horizon; a 2- to 5-inch ochric epipedon over a moderate fine prismatic, clay loam argillic horizon; and a 4-inch ochric epipedon over a weak medium prismatic, heavy clay natric horizon and a weakly cemented duripan within 11-inches of the soil surface. This community is probably a *Sarcobatus baileyi/Atriplex confertifolia/Artemisia spinescens* habitat-type.

The *Sarcobatus baileyi/Sitanion hystrix* community is encountered in the northwest part of the basin on north, northwest and west facing slopes of 4 to 8 percent. It occurs on soils with a 3-inch ochric epipedon over a massive, gravelly loamy sand C1 horizon; a 3-inch ochric epipedon over a massive, loamy sand C1 horizon; and a 2- to 5-inch ochric epipedon over a moderate fine prismatic, clay loam argillic horizon. This community is probably a seral representative of a *Sarcobatus baileyi/Oryzopsis hymenoides* habitat-type.

Climaxes:

Climax as used in this report is defined as the kind of community capable of perpetuation under the prevailing climatic, edaphic, physiographic or biotic condition. This definition is in accordance with the polyclimax concept where several climaxes constitute the vegetation in an area as the result of succession.

Climatic climax develops on land (moderately rolling to level) that is neither excessively nor inadequately drained, so that the major environmental conditions affecting organisms are climatic. Physiographic climax is determined in large measure by the nature of the topography (land relief). Edaphic climax is determined largely by the nature of the soil. A physiographic-edaphic climax is determined most strongly by both topography and soils. A biotic climax is determined by the incidence and maintenance of a decisive "biotic factor" such as the continuous heavy grazing by animals (Hanson, 1962).

Most communities have been affected by grazing use and areas of relatively undisturbed vegetation are not common. Consequently, a majority of the communities are biotic climaxes. For this reason an estimate of the climax of each community was based on their present condition and probable habitat-type (Table 29).

RECREATION

The watershed is not located close to a populated area. At present this remoteness makes the basin of little value for recreational development. However, the watershed does contain features that may intrigue a certain type of recreationist: (1) Many unpatented mining claims and some mill sites have been located in the area since the 1800's. Most of these mines and mills are in ruins. (2) Rock and bottle hounding, and (3) hunting chukar partridge which are quite abundant in the area, are also possibilities for the watershed.

Table 29. Type of climaxes associated with the probably habitat-types and present communities in the Cow Creek Watershed.

Probable Habitat-type and Communities	Type of Climax				
	Climatic	Physio-graphic	Edaphic	Physio-graphic-Edaphic	Biotic
A.[a] *Artemisia arbuscula/Festuca idahoensis*				X	
1[b] *A. arbuscula/Poa secunda*					X
B.[a] *Artemisia tridentata/Elymus cinereus*			X		
1[b] *A. tridentata/Chrysothamnus nauseosus/Sitanion hystrix*					X
2[b] *C. nauseosus/Sarcobatus vermiculatus/A. tridentata/ Distichlis stricta*					X
C.[a] *A. tridentata/Grayia spinosa/Oryzopsis hymenoides*			X		
1[b] *A. tridentata/Grayia spinosa*					X
D.[a] *A. tridentata/Stipa thurberiana*				X	
1[b] *A. tridentata/Poa secunda*					X
E.[a] *Atriplex confertifolia/Artemisia spinescens/Eurotia lanata/Oryzopsis hymenoides*			X		
1[b] *A. confertifolia/A. spinescens/E. lanata*					X
F.[a] *A. confertifolia/A. spinescens/O. hymenoides*	X				
1[b] *A. confertifolia/A. spinescens/S. hystrix*					X
G.[ab] *A. confertifolia/A. spinescens/S. vermiculatus*			X		
H.[a] *Atriplex confertifolia/Oryzopsis hymenoides*				X	
1[b] *A. confertifolia/Bromus tectorum*					X
I.[a] *Juniperus osteosperma/A. arbuscula/Oryzopsis webberi*				X	
1[b] *J. osteosperma/A. arbuscula/Poa secunda*					X
J.[a] *J. osteosperma/A. tridentata/Stipa thurberiana*				X	
1[b] *J. osteosperma/A. tridentata/Poa secunda*					X
K.[ab] *Poa nevadensis/Carex* sp.			X		
L.[ab] *Sarcobatus baileyi/Atriplex confertifolia/A. spinescens*			X		
M.[a] *Sarcobatus baileyi/Oryzopsis hymenoides*			X		
1[b] *S. baileyi/Sitanion hystrix*					X

a Habitat-type
b Present community
ab Habitat-type and present community

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APPENDIX A. Precipitation data for the Cow Creek Watershed.

Rain Can	Mean Annual Precipitation* (inches)
1	7.0
2	5.5
3	6.1
4	7.1
5	6.2
6	6.3
7	7.0
8	6.4
9	7.1
10	6.3
11	6.5
12	6.6
13	7.1
14	7.0
15	7.9
16	8.0
Mean	6.8

* Annual precipitation is based on 4 consecutive hydrologic years (October 1 to September 30) 1965 through 1968.

APPENDIX A (cont'd)

Community	Annual* Precipitation (inches)
Artemisia arbuscula/Poa secunda	8.0
Artemisia tridentata/Chrysothamnus nauseosus/Sitanion hystrix	7.5
Artemisia tridentata/Grayia spinosa	6.7
Artemisia tridentata/Poa secunda	7.5
Atriplex confertifolia/Artemisia spinescens/Eurotia lanata	6.2
Atriplex confertifolia/A. spinescens/Sarcobatus vermiculatus	6.8
A. confertifolia/A. spinescens/Sitanion hystrix	6.9
A. confertifolia/Bromus tectorum	6.7
C. nauseosus/S. vermiculatus/A. tridentata/Distichlis stricta	7.0
Juniperus osteosperma/A. arbuscula/Poa secunda	8.0
J. osteosperma/A. tridentata/Poa secunda	7.1
Poa nevadensis/Carex sp.	7.5
Sarcobatus baileyi/A. confertifolia/A. spinescens	6.6
S. baileyi/Sitanion hystrix	6.8

*Annual precipitation is based on rain cans in or near each community and on 4 consecutive hydrologic years (October 1 to September 30) 1965 through 1968.

APPENDIX B. Soil Families and Subgroups as Associated with the Cow Creek Watershed Plant Communities.

Sandy, mixed, mesic, shallow family of Typic Torripsamments

Typically these soils have a 3-inch ochric epipedon over a massive, gravelly loamy sand C1 horizon. Reaction of the solum increases with depth and ranges from neutral to strongly alkaline.

These soils are found at elevations around 4930 feet and are associated with the *Sarcobatus baileyi/Sitanion hystrix* community. They are found on west facing slopes of 4 percent. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.5 inches. Stoniness class is 0. There is slight sheet and wind erosion with some gullies present. The majority of the roots are found within 8 inches of the surface.

A1	0-3"	Very pale brown (10YR7/3) loamy sand, dark brown (10YR3/3) moist; strong fine platy; slightly hard, very friable, slightly sticky, nonplastic; few fine roots; organic matter 0.4 percent, conductivity 0.7 mmhos., cation exchange capacity 25.2 meq.; noneffervescent; neutral (pH 7.3); vesicular pores; abrupt smooth boundary.
C1	3-8"	Yellowish brown (10YR5/4) gravelly loamy sand, dark brown (10YR3/3) moist; massive; slightly hard, friable, nonsticky, nonplastic; plentiful very fine and abundant fine roots; strongly effervescent; clear smooth boundary.
C2	8-21"+	Pale brown (10YR6/3) very gravelly sand, dark brown (7.5YR4/4) moist; massive, soft, very friable, nonsticky, nonplastic; few fine roots; violently effervescent; weathered conglomerate.

APPENDIX B-2

Sandy-skeletal, mixed, mesic family of Typic Torripasmments

Characteristically these soils have a 3-inch ochric epipedon over a massive, loamy sand C1 horizon. Reaction of the solum increases with depth and ranges from mildly alkaline to moderately alkaline.

These soils are found at elevations around 4900 feet and are associated with the *Sarcobatus baileyi/Sitanion hystrix* community. They are found on north facing slopes of 4 to 8 percent. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the B hydrologic group and have a profile available water holding capacity of 1.9 inches. Stoniness class is 0. There is slight to moderate gully and sheet erosion. Majority of the roots are found within 14 inches of the surface.

A1 0-3" Very pale brown (10YR7/3) loamy sand, dark brown (10YR3/3) moist; strong fine platy; slightly hard, very friable, slightly sticky, nonplastic; few fine roots; organic matter 0.3 percent, conductivity 0.7 mmhos., cation exchange capacity 26.5 meq.; noneffervescent; mildly alkaline (pH 7.7); vesicular pores; abrupt smooth boundary.

C1 3-7" Yellowish brown (10YR5/4) loamy sand, dark brown (10YR3/3) moist; massive; slightly hard, friable, slightly sticky, nonplastic; plentiful very fine, abundant fine, and few medium roots; organic matter 0.2 percent, conductivity 0.8 mmhos., strongly effervescent; moderately alkaline (pH 7.9); clear smooth boundary.

C2 7-21" Yellowish brown (10YR5/4) gravelly sand, dark brown (10YR3/3) moist; massive; slightly hard, friable, nonsticky, nonplastic; few very fine, abundant fine, and few medium roots; strongly effervescent; abrupt smooth boundary.

IIC3 21-29"+ Pale brown (10YR6/3) very gravelly sand, dark brown (7.5YR4/4) moist; massive, soft, very friable, nonsticky, nonplastic; few fine roots; violently effervescent.

Sandy-skeletal, mixed, mesic family of Typic Torrifluvents

Characteristically these soils have a 17-inch ochric epipedon over a massive, very gravelly loamy sand IIC1 horizon. Reaction of the solum increases with depth and ranges from moderately alkaline to strongly alkaline.

These soils are found at elevations around 5025 feet and are associated with the *Chrysothamnus nauseosus/Sarcobatus vermiculatus/Artemisia tridentata/Distichlis stricta* community. They are found on northeast facing slopes of 2 to 4 percent. The macrorelief is undulating and microrelief is interrupted. These soils belong to the B hydrologic group and have a profile available water holding capacity of 2.8 inches. Stoniness class is 0. Erosion is slight to moderate with gullies common. Majority of the roots are found within 26 inches of the surface.

A 11	0-7"	Light brownish gray (10YR6/2) loamy sand, very dark grayish brown (10YR3/2) moist; massive; soft, very friable, nonsticky, nonplastic; abundant very fine, abundant fine and plentiful medium roots; organic matter 2.2 percent, conductivity 1.8 mmhos., cation exchange capacity 20.1 meq.; noneffervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.
A 12	7-17"	Light brownish gray (10YR6/2) loamy sand, very dark grayish brown (10YR3/2) moist; weak medium granular; soft, very friable, nonsticky, nonplastic; abundant very fine, fine and medium roots; noneffervescent; abrupt smooth boundary.
IIC1	17-24"	Dark brown (10YR3/2) moist; very gravelly loamy sand; massive; soft, very friable, nonsticky, nonplastic; abundant very fine, abundant fine and plentiful medium roots; violently effervescent; abrupt smooth boundary.
IIIC2	24-35"+	Pale brown (10YR6/3) gravelly cobbly loamy sand, dark brown (10YR3/3) moist; massive; soft, very friable, nonsticky, nonplastic; plentiful very fine and plentiful fine roots; violently effervescent.

APPENDIX B-4

Loamy-skeletal, mixed, mesic family of Typic Camborthids

These soils characteristically have a 7-inch ochric epipedon over a massive, very gravelly fine sandy loam cambic horizon. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations around 5710 feet and are associated with the *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* community. They are found on south facing fans of 2 percent slope. The macrorelief is flat and the microrelief is uniform convex. These soils belong to the B hydrologic group and have a profile available water holding capacity of 1.9 inches. Stoniness class is 2. There is slight wind erosion, "blow-outs" are common. The majority of the root distribution is within 19 inches of the soil surface.

A1	0-7"	Light gray (10YR7/2) gravelly fine sandy loam, dark grayish brown (10YR4/2) moist; weak medium platy; soft, very friable, slightly sticky, nonplastic; plentiful very fine and plentiful fine roots; organic matter 0.6 percent, conductivity 0.6 mmhos., cation exchange capacity 12.5 meq.; noneffervescent; neutral (pH 6.7); vesicular pores; clear smooth boundary.
B2	7-11"	Very pale brown (10YR7/3) gravelly fine sandy loam, dark grayish brown (10YR4/2) moist; massive, soft, very friable, slightly sticky, nonplastic; plentiful very fine, plentiful fine, and few medium roots; organic matter 0.4 percent, conductivity 0.5 mmhos., noneffervescent; mildly alkaline (pH 7.4); clear smooth boundary.
C1	11-19"	Very pale brown (10YR7/3) very gravelly fine sandy loam, dark brown (10YR4/3) moist; massive; soft, very friable, nonsticky, nonplastic; abundant very fine, abundant fine, and few medium roots; violently effervescent; abrupt smooth boundary.
IIC2	19-29"+	Very pale brown (10YR7/3) very gravelly fine sandy loam, dark brown (10YR4/3) moist; massive, soft, very friable, nonsticky, nonplastic; few fine and few very fine roots; noneffervescent.

APPENDIX B-5

Coarse-loamy, mixed, mesic family of Typic Camborthids

Typically these soils have a 9-inch ochric epipedon over a moderate, medium platy, silt loam cambic horizon. Reaction of the soil is moderately alkaline.

These soils are usually found at elevations from 4300 to 4350 feet and are associated with the *Atriplex confertifolia/Artemisia spinescens/Eurotia lanata*, *Atriplex confertifolia/Artemisia spinescens/Sarcobatus vermiculatus*, and *Sarcobatus baileyi/Atriplex confertifolia/Artemisia spinescens* communities. They are found on north, east, south, and southwest facing drainage bottoms with 1 to 2 percent slope. The macrorelief is flat and the microrelief is interrupted mounds and pits. These soils belong to the B hydrologic group and have a profile available water holding capacity of 6.5 inches. Stoniness class is 0. There is slight to moderate sheet, wind and gully erosion. Root distribution is mostly within the upper 40 inches.

A1	0-9"	Light gray (10YR7/2) silt loam, dark brown (10YR4/3) moist; strong fine platy; soft, very friable, nonsticky, slightly plastic; plentiful fine roots; organic matter 1.0 percent, conductivity 0.5 mmhos., cation exchange capacity 18.3 meq.; violently effervescent; moderately alkaline (pH 8.1); clear smooth boundary.
B2	9-30"	Light brownish gray (10YR7/2) silt loam, dark brown (10YR4/3) moist; moderate medium platy, soft, very friable, nonsticky, slightly plastic; plentiful very fine, abundant fine, and few medium roots; organic matter 0.7 percent, conductivity 0.6 mmhos., slightly effervescent; moderately alkaline (pH 8.1); abrupt smooth boundary.
IIC1	30-38"+	Very pale brown (10YR7/3) gravelly sandy loam, dark brown (10YR4/3) moist; massive; soft, very friable, nonsticky, nonplastic; plentiful very fine, plentiful fine, plentiful medium, and few coarse roots; strongly to violently effervescent; calcium accumulation on bottom of gravel.

APPENDIX B-6

Loamy-skeletal, mixed, mesic family of Duric Mollic Camborthids

Characteristically these soils have a 5-inch ochric epipedon over a massive, very gravelly fine sandy loam cambic horizon, with durinodes within 14-inches of the surface. Reaction of the solum is neutral.

These soils are usually found at elevations around 5250 feet and are associated with the *Artemisia tridentata/Poa secunda* community. They are found on northeast facing fans of 3 percent. The macrorelief is undulating and the microrelief is uniform convex. These soils belong to the B hydrologic group and have a profile available water holding capacity of 2.4 inches. Stoniness class is 3. There is slight gully erosion. The majority of the roots are within 18 inches of the soil surface.

A1	0-5"	Pale brown (10YR6/3) gravelly fine sandy loam, dark brown (10YR4/3) moist; weak fine platy; soft, very friable, nonsticky, slightly plastic; plentiful very fine roots; organic matter 1.5 percent, conductivity 0.4 mmhos., cation exchange capacity 13.5 meq.; non-effervescent; neutral (pH 7.0); vesicular pores; abrupt smooth boundary.
B2	5-14"	Pale brown (10YR6/3) very gravelly fine sandy loam, dark brown (10YR4/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; abundant very fine, abundant fine, and plentiful medium roots; organic matter 0.8 percent, conductivity 0.5 mmhos., noneffervescent; neutral (pH 6.8); clear smooth boundary.
C1ca	14-28"	Pale brown (10YR6/3) very gravelly sandy loam, dark brown (10YR4/3) moist; massive; slightly hard, friable, non-sticky, nonplastic; plentiful very fine, and few fine roots; slightly effervescent; durinodes; abrupt smooth boundary.
IIC2ca	28-33"+	Light brownish gray (10YR6/2) very gravelly sandy loam, dark grayish brown (10YR4/2) moist; massive; soft, loose, nonsticky, nonplastic; few very fine roots; violently effervescent.

APPENDIX B-7

Coarse-loamy, mixed, mesic family of Typic Durorthids

Typically these soils have a 5- to 6-inch ochric epipedon over a weak coarse prismatic, silt loam cambic horizon, and an indurated duripan within 17 inches of the surface. Reaction of the solum decreases with depth and ranges from moderately alkaline to mildly alkaline.

These soils are usually found at elevations from 4500 to 4800 feet and are associated with the *Atriplex confertifolia/Bromus tectorum* and *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* communities. They are found on northwest, north, northeast and east facing fans with 1 to 9 percent slope. The macrorelief is flat or rolling and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 0.6 to 3.2 inches. Stoniness class is 0 to 2. There is moderate wind erosion and slight sheet, rill and gully erosion. The majority of the roots are within 21 inches of the surface.

A1 0-5" Very pale brown (10YR7/3) silt loam, yellowish brown (10YR5/4) moist; strong very fine platy; soft, very friable, nonsticky, slightly plastic; few fine roots; organic matter 1.1 percent, conductivity 1.2 mmhos., cation exchange capacity 26.0 meq.; strongly effervescent; moderately alkaline (pH 8.3); vesicular pores; abrupt smooth boundary.

B2 5-17" Pale brown (10YR6/3) silt loam, yellowish brown (10YR5/6) moist; weak coarse prismatic; slightly hard, friable, slightly sticky, slightly plastic; few fine and few medium roots; organic matter 0.8 percent, conductivity 4.5 mmhos., strongly effervescent; mildly alkaline (pH 7.8); abrupt smooth boundary.

C1casim 17-21" White (10YR8/2) indurated duripan, very pale brown (10YR8/4) moist; strong medium platy; extremely hard, extremely firm, nonsticky, nonplastic; few very fine roots; violently effervescent; abrupt smooth boundary.

C2casi 21-29" Yellowish brown (10YR5/6) moist; gravelly sandy loam; massive; slightly hard, friable, nonsticky, nonplastic; few very fine roots; strongly effervescent; clear smooth boundary.

R1 29-42"+ Yellowish brown (10YR5/8) moist; very gravelly sandy loam; massive; slightly hard to hard, friable, nonsticky, nonplastic; strongly effervescent; weathered rock.

APPENDIX B-8

Clayey-skeletal, mixed, mesic family of Typic Haplargids

Typically these soils have a 3-inch ochric epipedon over a moderate medium subangular blocky, gravelly clay loam argillic horizon. Reaction of the solum is mildly alkaline.

These soils are usually found at elevations around 4880 feet and are associated with the *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* community. They are found on west facing fans with 8 percent slope. The macrorelief is rolling and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 2.8 inches. Stoniness class is 2. There is slight wind erosion. The majority of the roots are within 13 inches of the soil surface.

A1	0-3"	Light gray (10YR7/2) gravelly sandy loam, grayish brown (10YR5/2) moist; massive; slightly hard, friable, nonsticky, nonplastic; few fine roots; organic matter 1.6 percent, conductivity 1.2 mmhos., cation exchange capacity 21.5 meq.; strongly effervescent; mildly alkaline (pH 7.5); abrupt smooth boundary.
B2t	3-9"	Very pale brown (10YR7/3) gravelly clay loam, yellowish brown (10YR5/4) moist; moderate medium subangular blocky; slightly hard, friable, sticky, plastic; plentiful very fine, abundant fine roots; organic matter 1.3 percent, conductivity 0.8 mmhos., strongly effervescent, mildly alkaline (pH 7.8); clear smooth boundary.
B3ca	9-14"	Very pale brown (10YR8/3) gravelly clay loam, yellowish brown (10YR5/4) moist; weak medium subangular blocky; slightly hard, friable, sticky, plastic; plentiful very fine, plentiful fine roots; violently effervescent; abrupt smooth boundary.
C1ca	14-28"+	Very pale brown (10YR8/4) very gravelly sandy loam, light yellowish brown (10YR6/4) moist; massive, soft, very friable, nonsticky, nonplastic; few fine roots; violently effervescent.

APPENDIX B-9

Fine, mixed, mesic family of Typic Haplargids

These soils characteristically have a 5-inch ochric epipedon over a moderate medium subangular blocky, clay argillic horizon. Reaction of the solum is mildly alkaline.

These soils are usually found at elevations around 4910 feet and are associated with the *Sarcobatus baileyi/Atriplex confertifolia/ Artemisia spinescens* community. They are found on north facing fans and terraces with 3 percent slope. The macrorelief is rolling and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.8 inches. Stoniness class is 2. Erosion is none to slight. The majority of the roots are within 18 inches of the soil surface.

A 1	0-5"	Very pale brown (10YR7/3) gravelly silt loam, dark brown (10YR4/3) moist; strong fine platy; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; organic matter 0.8 percent, conductivity 0.6 mmhos., cation exchange capacity 24.6 meq.; strongly effervescent; mildly alkaline (pH 7.8); vesicular pores; abrupt smooth boundary.
B2t	5-11"	Dark brown (7.5YR4/4) moist; clay; moderate medium subangular blocky; slightly hard,friable, very sticky, very plastic; abundant very fine, abundant fine, and few medium roots; organic matter 1.0 percent, conductivity 0.5 mmhos., strongly effervescent; mildly alkaline (pH 7.7); clear smooth boundary.
B3ca	11-18"	Very pale brown (10YR7/3) gravelly silt loam, light yellowish brown (10YR6/4) moist; weak medium subangular blocky; soft, very friable, slighty sticky, nonplastic; plentiful very fine, plentiful fine roots; violently effervescent; clear smooth boundary.
C1	18-27"+	Very pale brown (10YR7/4) very gravelly sandy loam, yellowish brown (10YR5/4) moist; massive; soft, very friable, nonsticky, nonplastic; few fine roots; violently effervescent.

APPENDIX B-10

Fine-loamy, mixed, mesic family of Typic Haplargids

Characteristically these soils have a 2- to 5-inch ochric epipedon over a moderate fine prismatic, clay loam argillic horizon. Reaction of the solum is moderately alkaline.

These soils are usually found at elevations from 4320 to 4930 feet and are associated with the *Sarcobatus baileyi/Atriplex confertifolia/Artemisia spinescens* and *Sarcobatus baileyi/Sitanion hystrix* communities. They are found on north and northwest facing slopes and fans of 3 to 6 percent. The macrorelief is undulating or hilly and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 3.5 to 4.4 inches. Stoniness class is 0 to 3. There is none to slight wind erosion. The majority of the roots are within 20 inches of the soil surface.

A1	0-5"	Light brownish gray (10YR6/2) sandy loam, dark brown (10YR4/3) moist; strong medium platy; slightly hard, friable, nonsticky, nonplastic; organic matter 0.3 percent, conductivity 0.9 mmhos., cation exchange capacity 17.1 meq.; noneffervescent; moderately alkaline (pH 8.2); vesicular pores, abrupt smooth boundary.
B1	5-7"	Very pale brown (10YR7/3) sandy clay loam, dark yellowish brown (10YR4/4) moist; strong medium platy; hard, firm, slightly sticky, slightly plastic; plentiful very fine and plentiful fine roots; noneffervescent; abrupt smooth boundary.
B2t	7-14"	Dark brown (7.5YR4/4) moist; clay loam; moderate fine prismatic; hard, firm, sticky, plastic; abundant very fine and abundant fine roots; organic matter 0.4 percent, conductivity 6.0 mmhos., strongly effervescent; moderately alkaline (pH 8.0); few lime mottles, clear smooth boundary.
B3ca	14-24"	Yellowish brown (10YR5/4) moist; sandy clay loam; massive; slightly hard, friable, slightly sticky, plastic; few very fine, plentiful fine roots; strongly effervescent; lime mottles; gradual smooth boundary.
C1ca	24-27"+	Very pale brown (10YR7/3) sandy loam, yellowish brown (10YR5/4) moist; slightly hard, very friable, slightly sticky, slightly plastic; few fine roots; violently effervescent.

APPENDIX B-11

Fine, mixed, mesic family of Mollic Haplargids

Typically these soils have a 9-inch ochric epipedon over a strong medium subangular blocky, fine gravelly clay argillic horizon. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations around 5100 feet and are associated with the *Artemisia tridentata/Chrysothamnus nauseosus/Sitanion hystrix* community. They are found on northeast facing fans of 2 to 4 percent slope. The macrorelief is flat to undulating and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 4.1 inches. Stoniness class is 1. There is slight sheet and rill erosion. The majority of the root distribution is within 20 inches of the soil surface.

A11	0-4"	Light gray (10YR7/2) gravelly fine sandy loam, grayish brown (10YR5.2) moist; strong fine platy; slightly hard, friable, nonsticky, nonplastic; few very fine and plentiful fine roots; organic matter 0.6 percent, conductivity 0.7 mmhos., cation exchange capacity 17.9 meq.; noneffervescent; neutral (pH 7.3); vesicular pores; abrupt smooth boundary.
A12	4-9"	Very pale brown (10YR7/3) gravelly fine sandy loam, dark brown (10YR4/3) moist; moderate fine platy; soft, friable, nonsticky, nonplastic; plentiful very fine, plentiful fine, and few medium roots; noneffervescent; abrupt smooth boundary.
B2t	9-13"	Dark yellowish brown (10YR4/4) moist; fine gravelly clay; strong medium subangular blocky,extremely hard, firm, very sticky, very plastic; plentiful very fine, plentiful fine, and plentiful medium roots; organic matter 0.3 percent; conductivity 7.3 mmhos., non-effervescent; moderately alkaline (pH 8.1); clay films; abrupt smooth boundary.
B3	13-19"	Dark yellowish brown (10YR4/4) moist; clay loam; moderate medium subangular blocky; slightly hard, friable, sticky, plastic; few very fine and few fine roots; slightly effervescent; clay films; abrupt smooth boundary.
C1	19-39"+	Dark brown (10YR4/3) gravelly loam; massive, soft, very friable, slightly sticky, slightly plastic; few fine roots; slightly effervescent.

APPENDIX B-12

Fine-loamy, mixed, mesic family of Mollic Haplargids

Characteristically these soils have a 6-inch ochric epipedon over a moderate fine prismatic, gravelly clay loam argillic horizon, with andesite within 38 inches of the surface. Reaction of the solum is mildly alkaline.

These soils are usually found at elevations around 4400 feet and are associated with the *Artemisia tridentata/Poa secunda* community. They are found on north and east facing slopes of 38 percent. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 4.2 inches. Stoniness class is 3. Erosion is slight to none. The majority of the root distribution is within 25 inches of the soil surface. Bedrock outcrop accounts for around 15 percent of this soil and associated plant community.

A1	0-6"	Light gray (10YR7/2) gravelly fine sandy loam, dark brown (10YR4/3) moist; strong fine platy; slightly hard, friable, nonsticky, nonplastic; abundant very fine and abundant fine roots; organic matter 1.0 percent, conductivity 1.0 mmhos., cation exchange capacity 20.9 meq.; noneffervescent; mildly alkaline (pH 7.7); vesicular pores; abrupt smooth boundary.
B2t	6-14"	Light yellowish brown (10YR6/4) gravelly light clay loam, dark yellowish brown (10YR4/4) moist; moderate fine prismatic; hard, firm, sticky, plastic; plentiful very fine, and plentiful fine roots; organic matter 0.8 percent, conductivity 0.8 mmhos., noneffervescent; mildly alkaline (pH 7.7); pressure faces; clear smooth boundary.
B3	14-20"	Pale brown (10YR6/3) fine sandy loam, yellowish brown (10YR5/6) moist; massive; hard, friable, nonsticky, nonplastic; few very fine, plentiful fine and few medium roots; slightly effervescent; abrupt smooth boundary.
Clca	20-28"	White (10YR8/2) very gravelly sandy loam, yellowish brown (10YR5/4) moist; massive; hard, firm, nonsticky, nonplastic; few fine roots; violently effervescent; abrupt irregular boundary.
R1	28"+	Andesite.

APPENDIX B-13

Coarse-loamy, mixed, mesic family of Mollic Haplargids

These soils characteristically have a 4-inch ochric epipedon over a weak medium prismatic, sandy clay loam argillic horizon. Reaction of the solum increases with depth and ranges from neutral to moderately alkaline.

These soils are usually found at elevations around 4880 feet and are associated with the *Artemisia tridentata/Grayia spinosa* community. They are usually found on north facing drainage bottoms with slopes of 2 percent. The macrorelief is undulating and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 3.7 inches. Stoniness class is 1. There is slight sheet, rill and wind erosion. The majority of the root distribution is within 20 inches of the soil surface.

A1	0-4"	Very pale brown (10YR7/3) gravelly sandy loam, dark brown (10YR4/3) moist; weak fine granular; soft, very friable, nonsticky, nonplastic; plentiful very fine and abundant fine roots; organic matter 0.8 percent, conductivity 0.6 mmhos., cation exchange capacity 47.5 meq.; noneffervescent; neutral (pH 7.3); abrupt smooth boundary.
B2	4-9"	Pale brown (10YR6/3) sandy clay loam, dark yellowish brown (10YR4/4) moist; weak medium prismatic; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine, and few medium roots; organic matter 0.5 percent, conductivity 0.5 mmhos., noneffervescent; moderately alkaline (pH 7.9); few clay skins; clear smooth boundary.
B3	9-13"	Pale brown (10YR6/3) heavy sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, nonsticky, nonplastic; plentiful very fine, plentiful fine, and plentiful medium roots; noneffervescent; clear smooth boundary.
C1ca	13-20"	Very pale brown (10YR8/3) sandy loam, yellowish brown (10YR5/4) moist; massive; slightly hard, friable, nonsticky, nonplastic; few very fine and few fine roots; violently effervescent; gradual smooth boundary.
C2ca	20-30"	Very pale brown (10YR7/3) gravelly sandy loam, dark yellowish brown (10YR4/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine and few fine roots; violently effervescent; clear smooth boundary.
C3ca	30-36"+	Very pale brown (10YR7/3) very gravelly sandy loam, yellowish brown (10YR5/4) moist; massive; soft, very friable, nonsticky, nonplastic; violently effervescent.

APPENDIX B-14

Fine, mixed, mesic family of Duric Haplargids

These soils typically have a 3-inch ochric epipedon over a weak fine subangular blocky, clay argillic horizon and durinodes within 14 inches of the surface. Reaction of the solum decreases with depth and ranges from moderately alkaline to mildly alkaline.

These soils are usually found at elevations around 4400 feet and are associated with the *Atriplex confertifolia/Artemisia spinescens/ Eurotia lanata* community. They are found on south facing fans with slopes of 3 percent. The macrorelief is rolling and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 3.7 inches. Stoniness class is 1. There is slight to moderate wind erosion. The majority of the root distribution is within 14 inches of the soil surface.

A1	0-3"	Light gray (2.5YR7/2) fine sandy loam, grayish brown (2.5YR5/2) moist; strong medium prismatic; slightly hard, very friable, nonsticky, nonplastic; few very fine and plentiful fine roots; organic matter 0.4 percent, conductivity 0.6 mmhos., cation exchange capacity 18.9 meq.; strongly effervescent; moderately alkaline (pH 7.9); vesicular pores; abrupt smooth boundary.
B2t	3-7"	Yellowish brown (10YR5/4) moist; clay; weak fine subangular blocky; soft, very friable, very sticky, very plastic; abundant very fine, abundant fine, and few medium roots; organic matter 1.0 percent, conductivity 0.5 mmhos., violently effervescent; mildly alkaline (pH 7.6); clear smooth boundary.
B3casi	7-14"	White (10YR8/2) gravelly clay loam, light brownish gray (10YR6/2) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine, few medium roots; violently effervescent; lime mottles, durinodes present; clear smooth boundary.
C1ca	14-32"+	Light gray (5YR7/2) very gravelly sandy loam, light olive brown (2.5YR5/4) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine and plentiful fine roots; violently effervescent.

Fine-loamy, mixed, mesic family of Duric Mollic Haplargids

Characteristically these soils have an 8-inch ochric epipedon over a moderate medium subangular blocky, loam argillic horizon, and durinodes with 21 inches of the surface. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations around 5180 feet and are associated with the *Artemisia tridentata/Poa secunda* community. They are found on northwest facing fans with slopes of 2 to 4 percent. The macrorelief is undulating and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 4.0 inches. Stoniness class is 1. Erosion is slight to none. The majority of the root distribution is within 12 inches of the soil surface.

A1	0-3"	Light gray (10YR7/2) fine sandy loam, dark grayish brown (10YR4/2) moist; weak fine platy; soft, very friable, nonsticky, nonplastic; few very fine and few fine roots; organic matter 1.5 percent, conductivity 0.6 mmhos., cation exchange capacity 21.9 meq.; noneffervescent; neutral (pH 7.2); abrupt smooth boundary.
A12	3-8"	Light gray (10YR7/2) fine sandy loam, dark brown (10YR4/3) moist; weak fine subangular blocky; soft, very friable, nonsticky, nonplastic; plentiful very fine, plentiful fine, plentiful medium roots, noneffervescent; abrupt smooth boundary.
B2t	8-13"	Very pale brown (10YR7/3) heavy loam, brown (10YR5/3) moist; moderate subangular blocky; slightly hard, friable, slightly sticky, plastic; plentiful fine and few coarse roots; organic matter 1.2 percent, conductivity 5.6 mmhos., noneffervescent; mildly alkaline (pH 7.6); clear smooth boundary.
B3	13-21"	Very pale brown (10YR7/4) light loam, yellowish brown (10YR5/6) moist; weak medium subangular blocky; soft, friable, slightly sticky, slightly plastic; few very fine and few fine roots; noneffervescent; abrupt smooth boundary.
C1	21-32"+	Very pale brown (10YR7/3) sandy loam, yellowish brown (10YR5/6) moist; massive; slightly hard, firm, nonsticky, nonplastic; strongly effervescent; durinodes present.

APPENDIX B-16

Fine-loamy, mixed, mesic family of Typic Durargids

Typically these soils have a 5-inch ochric epipedon over a strong fine prismatic, clay loam argillic horizon, and an indurated duripan within 13 inches of the surface. Reaction of the solum increases with depth and ranges from mildly alkaline to moderately alkaline.

These soils are found at elevations around 4520 feet and are associated with the *Atriplex confertifolia/Bromus tectorum* community. They are found on north facing fans with slopes of 1 to 2 percent. The macrorelief is flat and the microrelief is uniform flat. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.8 inches. Stoniness class is 1. There is slight wind erosion. The majority of the root distribution is within 13 inches of the soil surface.

A1	0-5"	Light brownish gray (10YR6/2) fine sandy loam, dark brown (10YR4/3) moist; strong fine platy; slightly hard, friable, nonsticky, nonplastic; organic matter 0.2 percent, conductivity 0.9 mmhos., cation exchange capacity 25.7 meq.; noneffervescent; mildly alkaline (pH 7.7); vesicular pores; abrupt smooth boundary.
B2t	5-9"	Light brown (7.5YR6/4) clay loam, dark brown (7.5YR4/4) moist; strong fine prismatic; hard, firm, sticky, plastic; plentiful very fine and plentiful fine roots; organic matter 0.9 percent, conductivity 1.2 mmhos., noneffervescent; moderately alkaline (pH 7.9); clay films; clear smooth boundary.
B3	9-13"	Very pale brown (10YR7/4) sandy clay loam, brown (7.5YR5/4) moist; massive; slightly hard, firm, slightly sticky, slightly plastic; plentiful very fine and plentiful fine roots; noneffervescent; abrupt smooth boundary.
Cicasim	13-15"	White (10YR8/2) indurated duripan, yellow (10YR7/6) moist; massive; extremely hard, extremely friable, nonsticky, nonplastic; few fine roots; violently effervescent; abrupt smooth boundary.
C2ca	15-26"+	Very pale brown (10YR7/3) gravelly sandy loam, yellowish brown (10YR5/4) moist; massive; soft, friable, nonsticky, nonplastic; few very fine and few fine roots; slightly effervescent.

APPENDIX B-17

Fine, mixed, mesic family of Haplic Durargids

These soils characteristically have a 7-inch ochric epipedon over a weak fine subangular blocky, clay argillic horizon, and a strongly cemented duripan within 15 inches of the surface. Reaction of the solum decreases with depth and ranges from mildly alkaline to neutral.

These soils are usually found at elevations around 5675 feet and are associated with the *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* community. They are found on southeast facing fans with slopes of 2 percent. The macrorelief is flat and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 3.3 inches. Stoniness class is 1. There is moderate wind erosion. The majority of the root distribution is within 15 inches of the soil surface.

A1	0-7"	Very pale brown (10YR7/3) fine sandy loam, dark brown (10YR4/3) moist; weak fine platy; soft, very friable, nonsticky, nonplastic; abundant very fine and abundant fine roots; organic matter 1.2 percent, conductivity 1.2 mmhos., cation exchange capacity 14.9 meq.; noneffervescent; mildly alkaline (pH 7.4); vesicular pores; abrupt smooth boundary.
B2t	7-11"	Dark yellowish brown (10YR4/4) moist; clay; weak fine subangular blocky; slightly hard, friable, very sticky, very plastic; abundant very fine, abundant fine and few medium roots; organic matter 0.6 percent; conductivity 0.4 mmhos., noneffervescent; neutral (pH 7.2); clay films; abrupt smooth boundary.
B3casi	11-15"	Light yellowish brown (10YR6/4) gravelly clay loam, dark brown (7.5YR4/4) moist; massive; soft, very friable, sticky, plastic; plentiful very fine, few fine roots; slightly effervescent; abrupt smooth boundary.
C1casim	15-18"	White (10YR8/2) weakly cemented duripan, very pale brown (10YR8/3) moist; massive; hard, firm, nonsticky, nonplastic; few very fine roots; violently effervescent; abrupt wavy boundary.
C2ca	18-26"+	Light gray (10YR7/2) gravelly fine sandy loam, yellowish brown (10YR5/4) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; strongly effervescent; few lime mottles.

APPENDIX B-18

Fine, mixed, mesic family of Mollic Durargids

These soils characteristically have a 2- to 6-inch ochric epipedon over a moderate medium angular blocky, clay argillic horizon, and a duripan within 11 to 21 inches of the surface. Reaction of the solum is mildly alkaline.

These soils are usually found at elevations from 5225 to 5350 feet and are associated with the *Artemisia tridentata/Poa secunda* community. They are found on northeast, south, and west facing fans and slopes with 3 to 29 percent. The macrorelief is rolling or mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.7 to 4.2 inches. Stoniness class ranges 3 to 4. Erosion is very slight to none. The majority of the root distribution is usually within 21 inches of the soil surface.

A1	0-6"	Pale brown (10YR6/3) gravelly very fine sandy loam, dark brown (10YR4/3) moist; moderate fine platy; soft, very friable, nonsticky, nonplastic; plentiful very fine and plentiful fine roots; organic matter 1.0 percent, conductivity 0.4 mmhos., cation exchange capacity 11.8 meq.; noneffervescent; mildly alkaline (pH 7.4); vesicular pores; abrupt smooth boundary.
B21t	6-10"	Dark brown (10YR3/3) moist; clay; moderate medium angular blocky; hard, firm, very sticky,very plastic; abundant very fine, abundant fine and plentiful medium roots; organic matter 0.8 percent, conductivity 6.5 mmhos.; noneffervescent; mildly alkaline (pH 7.4); clay films; clear smooth boundary.
B22t	10-15"	Yellowish brown (10YR4/4) moist; gravelly clay loam; massive; slightly hard, friable, very sticky, very plastic; plentiful very fine, plentiful fine, and few medium roots; noneffervescent; clay films; clear smooth boundary.
B3casi	15-21"	Yellowish brown (10YR4/4) moist; gravelly silt loam; massive; hard, firm, slightly sticky, slightly plastic; plentiful very fine, few fine, and few medium roots; strongly effervescent; few clay films; abrupt smooth boundary.
C1casim	21-27"+	Very pale brown (10YR8/3) indurated duripan, pale brown (10YR6/3) moist; massive; violently effervescent; few very fine roots.

APPENDIX B-19

Fine, mixed, mesic family of Haplic Mollic Durargids

These soils characteristically have a 4-inch ochric epipedon over a strong medium angular blocky, gravelly clay argillic horizon, with a weakly cemented duripan within 16 inches of the surface. Reaction of the solum is mildly alkaline.

These soils are usually found at elevations around 5400 feet and are associated with the *Artemisia tridentata/Poa secunda* community. They are found on west facing slopes of 24 percent. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 3.1 inches. Stoniness class is 2. There is slight to no erosion.

A1	0-4"	Very pale brown (10YR7/3) very gravelly loam, dark grayish brown (10YR4/2) moist; weak fine granular; soft, very friable, slightly sticky, slightly plastic; few very fine, plentiful fine roots; organic matter 1.9 percent, conductivity 0.8 mmhos., cation exchange capacity 24.0 meq.; noneffervescent; mildly alkaline (pH 7.7); vesicular pores; abrupt smooth boundary.
B1	4-6"	Reddish brown (5 YR5/4) gravelly light clay, dark brown (10YR4/3) moist; moderate fine subangular blocky; slightly hard, friable, very sticky, very plastic; plentiful very fine and plentiful fine roots; non-effervescent; abrupt smooth boundary.
B2t	6-11"	Yellowish brown (10YR5/4) gravelly heavy clay, dark brown (10YR3/3) moist; strong medium angular blocky; hard, friable, very sticky, very plastic; abundant very fine, abundant fine, few medium, and few coarse roots; organic matter 0.9 percent, conductivity 5.1 mmhos., noneffervescent; mildly alkaline (pH 7.4); clay films; clear smooth boundary.
B3ca	11-16"	Pale brown (10YR6/3) gravelly clay loam, dark yellowish brown (10YR4/4) moist; moderate medium angular blocky; hard, friable, sticky, plastic; plentiful very fine, few fine roots; strongly effervescent; clear smooth boundary.
C1casim	16-22"	Very pale brown (10YR7/3) weakly cemented duripan, dark yellowish brown (10YR4/4) moist; massive; hard, firm, slightly sticky, slightly plastic; few very fine and few fine roots; violently effervescent; lime mottles; abrupt smooth boundary.
C2	22-40"+	Pale brown (10YR6/3) gravelly sandy loam, dark brown (10YR3/3) moist; massive; soft, very friable, nonsticky, nonplastic; few fine roots; strongly effervescent.

APPENDIX B-20

Very-fine, montmorillonitic, mesic family of Typic Natrargids

These soils characteristically have a 6-inch ochric epipedon over a strong fine columnar, heavy clay natric horizon, with weathered bedrock within 32 inches of the surface. Reaction of the solum increases with depth and ranges from mildly alkaline to moderately alkaline.

These soils are usually found at elevations from 4320 to 4825 feet and are associated with the *Atriplex confertifolia/Bromus tectorum* community. They are found on east, south and west facing slopes of 25 to 30 percent. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 5.3 inches. Stoniness class is 0 to 1. There is slight sheet, rill, gully and wind erosion. The majority of the root distribution is within 12 inches of the soil surface.

A1	0-6"	Light gray (10YR7/2) very gravelly clay loam, dark brown (10YR4/3) moist; moderate very fine platy; soft, friable, sticky, plastic; few fine roots; organic matter 1.1 percent, conductivity 1.2 mmhos., cation exchange capacity 32.6 meq.; noneffervescent; mildly alkaline (pH 7.7); vesicular pores; abrupt smooth boundary.
B1	6-9"	Dark brown (10YR3/3) moist; gravelly light clay; moderate very fine gravelly; soft, friable, very sticky, very plastic; plentiful very fine and abundant fine roots; noneffervescent; abrupt smooth boundary.
B21t	9-19"	Pale red (2.5YR6/2) heavy clay, reddish brown (2.5YR4/4) moist; strong fine columnar to strong medium blocky; extremely hard, extremely firm, very sticky, very plastic; plentiful very fine and plentiful fine roots; organic matter 1.3 percent, conductivity 7.2 mmhos., violently effervescent; moderately alkaline (pH 7.9); clear smooth boundary.
B22t	19-25"	Pale red (2.5YR6/2) heavy clay, reddish brown (2.5YR4/4) moist; strong medium columnar; extremely hard, very firm, very sticky, very plastic; plentiful very fine roots; very slightly effervescent; abrupt smooth boundary.
B3	25-32"	Light brownish gray (10YR6/2) gravelly clay loam, reddish brown (2.5YR5/4) moist; massive; slightly hard, friable, sticky, plastic; few fine roots; slightly effervescent; abrupt smooth boundary.
C1	32-36"+	Yellow (10YR7/6) weathered bedrock, yellowish brown (10YR5/6) moist; massive; noneffervescent.

APPENDIX B-21

Fine, montmorillonitic, mesic family of Typic Natrargids

These soils typically have a 2- to 5-inch ochric epipedon over a moderate medium prismatic, clay natric horizon. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations from 4830 to 5250 feet and are associated with the *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* and *Atriplex confertifolia/Bromus tectorum* communities. They are found on east facing fans and slopes of 1 to 10 percent. The macrorelief is hilly or undulating and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 4.2 to 6.2 inches. Stoniness class is 1 to 3. There is slight to no sheet and gully erosion. The majority of the root distribution is within 16 inches of the soil surface.

A1	0-5"	Light brownish gray (10YR6/2) very gravelly fine sandy loam, dark brown (10YR4/3) moist; moderate fine platy; slightly hard, very friable, nonsticky, nonplastic; plentiful very fine and few fine roots; organic matter 1.6 percent, conductivity 2.5 mmhos., cation exchange capacity 17.9 meq.; noneffervescent; neutral (pH 7.1); vesicular pores; abrupt smooth boundary.
B21	5-7"	Grayish brown (10YR5/2) gravelly clay, dark yellowish brown (10YR3/4) moist; weak fine subangular blocky; slightly hard, very friable, very sticky, very plastic; abundant very fine and plentiful fine roots; non-effervescent; abrupt smooth boundary.
B22t	7-24"	Light yellowish brown (10YR6/4) clay, dark brown (7.5YR4/4) moist; moderate medium prismatic to moderate medium angular blocky; hard, firm, very sticky, very plastic; abundant very fine, abundant fine, and plentiful medium roots; organic matter 1.3 percent, conductivity 5.3 mmhos., noneffervescent; mildly alkaline (pH 7.5); clay skins and pressure faces; clear smooth boundary.
B3	24-32"	Pale brown (10YR6/3) clay loam, brown (7.5YR5/4) moist; weak medium prismatic to weak medium angular blocky; slightly hard, very friable, sticky, plastic; few very fine and plentiful fine roots; strongly effervescent; few clay skins; clear smooth boundary.
C1ca	32-37"+	Very pale brown (10YR7/4) loam, brown (7.5YR5/4) moist; massive; soft, very friable, slightly sticky, slightly plastic; few very fine roots; violently effervescent.

APPENDIX B-22

Fine, montmorillonitic, mesic family of Duric Natrargids

Characteristically these soils have a 7-inch ochric epipedon over a medium moderate prismatic, clay natric horizon and durinodes within 24 inches of the surface. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations around 4880 feet and are associated with the *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* community. They are found on northwest facing toe slopes with 7 percent. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 4.9 inches. Stoniness class is 3. There is slight wind erosion. The majority of the root distribution is within 16 inches of the soil surface.

A1	0-7"	Very pale brown (10YR7/3) fine sandy loam, dark brown (10YR4/3) moist; weak fine platy; slightly hard, very friable, slightly sticky, nonplastic; plentiful very fine and few fine roots; organic matter 0.8 percent, conductivity 0.6 mmhos., cation exchange capacity 19.4 meq.; noneffervescent; neutral (pH 7.3); vesicular pores; abrupt smooth boundary.
B2	7-17"	Dark brown (7.5YR4/4) moist; clay; moderate medium prismatic breaking to strong medium angular blocky; extremely hard, firm, very sticky, very plastic; abundant very fine, abundant fine and few medium roots; organic matter 1.1 percent, conductivity 4.5 mmhos., noneffervescent; mildly alkaline (pH 7.4); pressure faces; clear smooth boundary.
B3	17-24"	Very pale brown (10YR7/4) gravelly light clay loam, yellowish brown (10YR5/6) moist; massive; slightly hard, friable, sticky, plastic; few very fine and few fine roots; strongly effervescent; abrupt smooth boundary.
C1casi	24-32"	Very pale brown (10YR8/3) gravelly sandy loam, yellowish brown (10YR5/6) moist; massive; hard, firm, nonsticky, nonplastic; few fine roots; violently effervescent; durinodes; abrupt smooth boundary.
C2	32-38"+	Very pale brown (10YR7/3) gravelly sandy loam, yellowish brown (10YR5/4) moist; massive; soft, very friable, nonsticky, nonplastic; few fine roots; noneffervescent.

APPENDIX B-23

Fine, montmorillonitic, mesic family of Typic Nadurargids

These soils characteristically have a 7-inch ochric epipedon over a moderate medium prismatic, gravelly clay natric horizon and an indurated duripan within 13 inches of the surface. Reaction of the solum is mildly alkaline.

These soils are usually found at elevations around 4880 feet and are associated with the *Atriplex confertifolia/Artemisia spinescens/Sitanion hystrix* community. They are found on south and west facing slopes of 2 to 7 percent. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.7 inches. Stoniness class is 3. There is slight wind erosion. The majority of the root distribution is within 13 inches of the soil surface.

A1	0-7"	Very pale brown (10YR7/3) gravelly fine sandy loam, dark brown (10YR4/3) moist; weak fine platy; slightly hard, very friable, slightly sticky, nonplastic; plentiful very fine and few fine roots; organic matter 0.7 percent, conductivity 0.7 mmhos., cation exchange capacity 20.4 meq.; noneffervescent; mildly alkaline (pH 7.5); vesicular pores; abrupt smooth boundary.
B2t	7-13"	Dark brown (7.5YR4/4) moist; gravelly clay; moderate medium prismatic breaking to moderate medium angular blocky; extremely hard, firm, very sticky, very plastic; abundant very fine, plentiful fine, and few medium roots; organic matter 1.1 percent, conductivity 0.7 mmhos., noneffervescent to very slightly effervescent; mildly alkaline (pH 7.5); pressure faces; abrupt smooth boundary.
Clcasim	13"+	Indurated duripan.

APPENDIX B-24

Fine, montmorillonitic, mesic family of Haplic Nadurargids

Typically these soils have a 4-inch ochric epipedon over a weak medium prismatic, heavy clay natric horizon and a weakly cemented duripan within 11 inches of the soil surface. Reaction of the solum is moderately alkaline.

These soils are usually found at elevations around 4210 feet and are associated with the *Sarcobatus baileyi/Atriplex confertifolia/ Artemisia spinescens* community. They are found on south facing fans with slopes of 1 percent. The macrorelief is undulating and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.3 inches. Stoniness class is 0. There is slight to moderate wind erosion with "blowouts" common. The majority of the root distribution is within 11 inches of the soil surface.

A1	0-4"	Light gray (10YR7/2) fine sandy loam, dark brown (10YR4/3) moist; moderate medium platy; slightly hard, very friable, nonsticky, nonplastic; few fine roots; organic matter 0.6 percent, conductivity 0.8 mmhos., cation exchange capacity 19.6 meq.; violently effervescent; moderately alkaline (pH 8.3); vesicular pores; abrupt smooth boundary.
B2t	4-8½"	Dark yellowish brown (10YR4/4) moist; heavy clay; weak medium prismatic breaking to moderate medium angular blocky; slightly hard, friable, very sticky, very plastic; abundant very fine, plentiful fine and few medium roots; organic matter 0.8 percent, conductivity 1.1 mmhos.; noneffervsecent; moderately alkaline (pH 7.9); few clay films; clear smooth boundary.
B3	8½-11"	Yellowish brown (10YR5/4) moist; light clay; massive; slightly hard, friable, sticky, plastic; plentiful very fine and plentiful fine roots; strongly effervescent; lime mottles; abrupt smooth boundary.
C1casim	11-17"	Very pale brown (10YR7/3) weakly cemented duripan, pale brown (10YR6/3) moist; massive; hard, firm, nonsticky, nonplastic; few very fine and few fine roots; violently effervescent; abrupt smooth boundary.
C2	17"+	Very pale brown (10YR8/3) gravelly sandy loam, light yellowish brown (10YR6/4) moist; massive; soft, very friable, nonsticky, nonplastic; few fine roots; strongly effervescent.

APPENDIX B-25

Fine-loamy, mixed, mesic family of Cumulic Haploquolls

These soils typically have a 38-inch plus mollic epipedon with a high watertable and a few mottles within 17 inches of the soil surface. Reaction of the solum decreases with depth and ranges from mildly alkaline to neutral.

These soils are usually found at elevations around 5215 feet and are associated with the *Poa nevadensis/Carex* sp. community. They are usually found on east facing drainage bottoms with slopes of 18 percent. The macrorelief is rolling and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 4.4 inches. Stoniness class is 0. There is slight gully erosion. The majority of the root distribution is within 12 inches of the soil surface.

A1	0-10"	Grayish brown (10YR5/2) gravelly fine sandy loam,very dark grayish brown (10YR3/2) moist; weak fine granular; soft, very friable, nonsticky, nonplastic; abundant very fine and abundant fine roots; organic matter 4.0 percent, conductivity 1.4 mmhos., cation exchange capacity 23.4 meq.; very slightly effervescent; mildly alkaline (pH 7.8); abrupt smooth boundary.
IIC1	10-19"	Black (10YR2/1) moist; clay loam; weak medium angular blocky; very friable, sticky, plastic; plentiful very fine and plentiful fine roots; organic matter 2.6 percent, conductivity 0.9 mmhos., noneffervescent; neutral (pH 7.1); few mottles in lower horizon, gradual smooth boundary.
IIIC2	19-38"+	Black (10YR2/1) moist; clay loam; massive; friable, sticky, plastic; few very fine, plentiful fine, and few medium roots; noneffervescent; mottles.

APPENDIX B-26

Coarse-loamy, mixed, mesic, shallow family of Entic Haploxerolls

These soils typically have a 14-inch mollic epipedon over a massive, gravelly silty clay loam C1 horizon and paralithic contact within 20 inches of the surface. Reaction of the surface horizon is neutral.

These soils are usually found at elevations around 5550 feet and are associated with the *Artemisia arbuscula/Poa secunda* community. They are found on north facing slopes of 45 percent. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 3.6 inches. Stoniness class is 4. Erosion is slight to none. The majority of the root distribution is within 20 inches of the soil surface.

A1	0-4"	Grayish brown (10YR5/2) gravelly clay loam, dark brown (10YR3/3) moist; weak fine gravelly; soft, very friable, sticky, plastic; abundant very fine and abundant fine roots; organic matter 3.1 percent, conductivity 0.4 mmhos., cation exchange capacity 23.8 meq.; noneffervescent; neutral (pH 6.9); clear smooth boundary.
A12	4-14"	Very dark grayish brown (10YR3/2) moist; gravelly clay loam; weak fine granular; soft, very friable, sticky, plastic; abundant very fine, abundant fine and plentiful medium roots; noneffervescent; clear smooth boundary.
C1	14-20"	Dark brown (10YR4/3) moist; gravelly silty clay loam; massive; slightly hard, friable, very sticky, very plastic; plentiful very fine, plentiful fine, and few medium roots; noneffervescent; abrupt smooth boundary.
R1	21"+	Paralithic contact with weathered Nevada wonderstone.

APPENDIX B-27

Very-fine, montmorillonitic, mesic family of Abruptic Durixerolls

Characteristically these soils have a 12-inch mollic epipedon over and in conjunction with a weak medium platy, gravelly heavy clay B21t argillic horizon, and an indurated duripan within 23 inches of the soil surface. Reaction of the solum decreases with depth and ranges from neutral to slightly acid.

These soils are usually found at elevations around 5900 feet and are associated with the *Juniperus osteosperma/Artemisia arbuscula/Poa secunda* community. They are found on north and east facing slopes of 22 percent. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.2 inches. Stoniness class is 3. There is slight to no erosion. The majority of the root distribution is within 10 inches of the soil surface. Rock outcrop accounts for 3 percent of this vegetation-soil unit.

A1	0-8"	Grayish brown (10YR5/2) gravelly clay loam, very dark grayish brown (10YR3/2) moist; weak fine platy to weak medium platy; soft, very friable, sticky, plastic; abundant very fine, abundant fine, and few medium roots; organic matter 2.6 percent, conductivity 0.8 mmhos., cation exchange capacity 10.9 meq.; noneffervescent; neutral (pH 6.9); abrupt smooth boundary.
B21t	8-12"	Dark brown (10YR3/3) moist; gravelly heavy clay; weak medium platy to strong medium angular blocky; hard, firm, very sticky, very plastic; plentiful very fine, plentiful fine, plentiful medium and few coarse roots; organic matter 1.0 percent, conductivity 0.5 mmhos., noneffervescent; slightly acid (pH 6.4); few clay films; abrupt smooth boundary.
B22t	12-20"	Dark yellowish brown (10YR3/4) moist; gravelly heavy clay; strong medium platy breaking to strong medium angular blocky; extremely hard, firm, very sticky, very plastic; few very fine and few fine roots; noneffervescent; clay films and pressure faces; clear smooth boundary.
B3	20-23"	Light yellowish brown (10YR6/4) gravelly light clay, dark yellowish brown (10YR4/4) moist; massive; hard, friable, very sticky, very plastic; few fine roots; noneffervescent; clay films; abrupt smooth boundary.
C1sicam	23-29"+	Very pale brown (10YR7/4) indurated duripan, dark yellowish brown (10YR4/4) moist; massive; extremely hard, firm, nonsticky, nonplastic; strongly effervescent.

APPENDIX B-28

Loamy-skeletal, mixed, mesic family of Haplic Durixerolls

These soils characteristically have an 8-inch mollic epipedon over a massive, very gravelly sandy loam cambic horizon and a weakly cemented duripan within 22 inches of the soil surface. Reaction of the solum is neutral.

These soils are usually found at elevations around 5550 feet and are associated with the *Artemisia tridentata/Poa secunda* community. They are found on northwest facing slopes of 45 percent. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.5 inches. Stoniness class is 4. There is slight to no erosion. The majority of the root distribution is within 14 inches of the soil surface.

A11	0-4"	Grayish brown (10YR5/2) very gravelly sandy loam, very dark grayish brown (10YR3/2) moist; weak medium granular; soft, very friable, nonsticky, nonplastic; abundant very fine and abundant fine roots; organic matter 3.5 percent, conductivity 0.8 mmhos., cation exchange capacity 20.6 meq.; noneffervescent; neutral (pH 7.2); abrupt smooth boundary.
A12	4-8"	Grayish brown (10YR5/2) very gravelly sandy loam, very dark grayisn brown (10YR3/2) moist; weak fine granular; soft, very friable, nonsticky, nonplastic; abundant very fine, abundant fine, and plentiful medium roots; noneffervescent; abrupt smooth boundary.
B2	8-22"	Dark brown (10YR3/2) moist; very gravelly sandy loam; massive; soft, very friable, nonsticky, nonplastic; plentiful very fine, plentiful fine, few medium and few coarse roots; organic matter 2.0 percent, conductivity 0.8 mmhos., noneffervescent; neutral (pH 7.0); abrupt smooth boundary.
Clsicam	22-25"+	Very pale brown (10YR8/3) weakly cemented duripan, very pale brown (10YR7/3) moist; massive; hard, firm, nonsticky, nonplastic; strongly effervescent.

APPENDIX B-29

Fine, mixed, mesic shallow family of Typic Argixerolls

These soils typically have a 10-inch mollic epipedon over and in conjuction with a massive, gravelly clay argillic horizon and paralithic contact within 14 inches of the surface. Reaction of the solum is neutral.

These soils are usually found at elevations around 5500 feet and are associated with the *Juniperus osteosperma/Artemisia tridentata/Poa secunda* community. They are found on northwest facing slopes of 25 percent. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.6 inches. Stoniness class is 3. There is slight gully and sheet erosion. The majority of the root distribution is within 10 inches of the soil surface.

A1	0-5"	Grayish brown (10YR5/2) heavy clay loam, very dark grayish brown (10YR3/2) moist; weak fine subangular blocky; soft, very friable, sticky, plastic; abundant very fine and abundant fine roots; organic matter 3.9 percent, conductivity 0.6 mmhos., cation exchange capacity 27.5 meq.; noneffervescent; vesicular pores; abrupt smooth boundary.
B2t	5-10"	Dusky red (2.5YR3/2) moist; heavy clay; moderate medium subangular blocky; slightly hard, friable, very sticky, very plastic; plentiful very fine, abundant fine, plentiful medium, and few coarse roots; organic matter 2.2 percent, conductivity 0.4 mmhos., non-effervescent; neutral (pH 6.7); clay films, clear smooth boundary.
B3	10-14"	Weak red (2.5YR4/2) moist; gravelly clay; massive; hard, firm, very sticky, very plastic; few very fine, few fine and few medium roots; noneffervescent; clear smooth boundary.
R1	14-23"	Paralithic contact with weathered sandstone and shale.

APPENDIX C. PLANT COMMUNITIES AND SOILS ASSOCIATION TABLE FOR THE COW CREEK WATERSHED

	Torripsamments		Torri-fluvents	Camborthids			Duror-thids	Haplargids								Durargids				Natrargids			Nadurargids		Hapla-quolls	Haplo-xerolls	Durixerolls		Argixe-rolls
COMMUNITY / SOIL	Sandy, mixed, mesic, shallow family of Typic Torripsamments	Sandy-skeletal, mixed, mesic family of Typic Torripsamments	Sandy-skeletal, mixed, mesic family of Typic Torrifluvents	Loamy-skeletal, mixed, mesic family of Typic Camborthids	Coarse-loamy, mixed, mesic family of Typic Camborthids	Loamy-skeletal, mixed, mesic family of Duric Mollic Camborthids	Coarse-loamy, mixed, mesic family of Typic Durorthids	Clayey-skeletal, mixed, mesic family of Typic Haplargids	Fine, mixed, mesic family of Typic Haplargids	Fine-loamy, mixed, mesic family of Typic Haplargids	Fine, mixed, mesic family of Mollic Haplargids	Fine-loamy, mixed, mesic family of Mollic Haplargids	Coarse-loamy, mixed, mesic family of Mollic Haplargids	Fine, mixed, mesic family of Duric Haplargids	Fine-loamy, mixed, mesic family of Duric Mollic Haplargids	Fine-loamy, mixed mesic family of Typic Durargids	Fine, mixed, mesic family of Haplic Durargids	Fine, mixed, mesic family of Mollic Durargids	Fine, mixed, mesic family of Haplic Mollic Durargids	Very-fine, montmorillonitic, mesic family of Typic Natrargids	Fine, montmorillonitic, mesic family of Typic Natrargids	Fine, montmorillonitic, mesic family of Haplic Natrargids	Fine, montmorillonitic, mesic family of Typic Nadurargids	Fine, montmorillonitic, mesic family of Haplic Nadurargids	Fine-loamy, mixed, mesic family of Cumulic Haplaquolls	Coarse-loamy, mixed, shallow family of Entic Haploxerolls	Very-fine, montmorillonitic, mesic family of Abruptic Durixerolls	Loamy-skeletal, mixed, mesic family of Haplic Durixerolls	Fine, mixed, mesic, shallow family of Typic Argixerolls
Artemisia arbuscula/ Poa secunda																										X			
Artemisia tridentata/ Chrysothamnus nauseosus/ Sitanion hystrix											X																		
Artemisia tridentata/ Grayia spinosa													X																
Artemisia tridentata/ Poa secunda						X						X			X			X	X									X	
Atriplex confertifolia/ Artemisia spinescens/ Eurotia lanata					X									X															
Atriplex confertifolia/ Artemisia spinescens/ Sarcobatus vermiculatus					X																								
Atriplex confertifolia/ Artemisia spinescens/ Sitanion hystrix				X			X	X									X				X	X	X						
Atriplex confertifolia/ Bromus tectorum							X									X				X	X								
Chrysothamnus nauseosus/ Sarcobatus vermiculatus/ Artemisia tridentata/ Distichlis stricta			X																										
Juniperus osteosperma/ Artemisia arbuscula/ Poa secunda																											X		
Juniperus osteosperma/ Artemisia tridentata/ Poa secunda																													X
Poa nevadensis/Carex sp.																									X				
Sarcobatus baileyi/ Atriplex confertifolia/ Artemisia spinescens					X				X	X														X					
Sarcobatus baileyi/ Sitanion hystrix	X	X								X																			

COW CREEK WATERSHED

Vegetation Mapping Units And Precipitation Recording Stations

Scale 1:63360

1 .5 0 1 2 3 4 Miles

Road

Legend

===== Improved Dirt

Precipitation Recording Stations

Legend

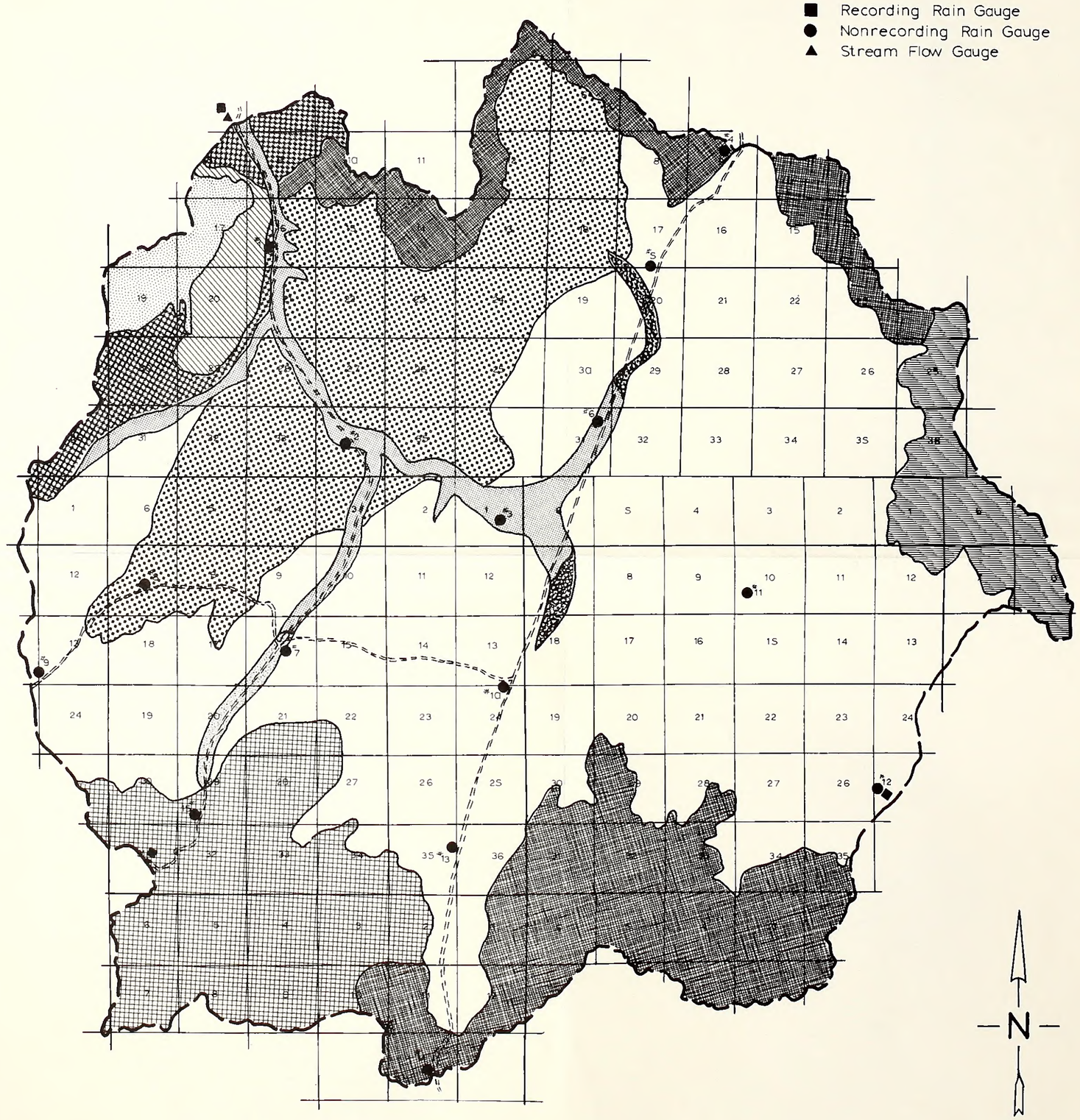
- ■ Recording Rain Gauge
- ● Nonrecording Rain Gauge
- ▲ Stream Flow Gauge

Vegetation Mapping Units

Legend

Symbol	%	
	75	Artemisia tridentata / Poa secunda
	22	Atriplex confertifolia / Artemisia spinescens / Sitanion hystrix
	3	Juniperus osteosperma / Artemisia tridentata / Poa secunda
	73	Artemisia tridentata / Poa secunda
	27	Atriplex confertifolia / Artemisia spinescens / Sitanion hystrix
	50	Artemisia tridentata / Poa secunda
	20	Artemisia arbuscula / Poa secunda
	18	Atriplex confertifolia / Artemisia spinescens / Sitanion hystrix
	7	Juniperus osteosperma / Artemisia arbuscula / Poa secunda
	5	Juniperus osteosperma / Artemisia tridentata / Poa secunda
	50	Artemisia tridentata / Poa secunda
	30	Juniperus osteosperma / Artemisia tridentata / Poa secunda
	20	Atriplex confertifolia / Artemisia spinescens / Sitanion hystrix
	60	Chrysothamnus nauseosus / Sarcobatus vermiculatus / Artemisia tridentata / Distichlis stricta
	40	Artemisia tridentata / Chrysothamnus nauseosus / Sitanion hystrix
	100	Atriplex confertifolia / Artemisia spinescens / Eurotia lanata
	85	Atriplex confertifolia / Artemisia spinescens / Sarcobatus vermiculatus
	12	Sarcobatus baileyi / Atriplex confertifolia / Artemisia spinescens
	3	Atriplex confertifolia / Artemisia spinescens / Eurotia lanata
	85	Atriplex confertifolia / Artemisia spinescens / Sitanion hystrix
	15	Artemisia tridentata / Poa secunda
	60	Atriplex confertifolia / Artemisia spinescens / Sitanion hystrix
	30	Artemisia tridentata / Poa secunda
	6	Atriplex confertifolia / Bromus tectorum
	2	Artemisia tridentata / Grayia spinosa
	2	Sarcobatus baileyi / Sitanion hystrix
	80	Sarcobatus baileyi / Atriplex confertifolia / Artemisia spinescens
	20	Artemisia tridentata / Poa secunda
	45	Sarcobatus baileyi / Atriplex confertifolia / Artemisia spinescens
	18	Atriplex confertifolia / Artemisia spinescens / Sitanion hystrix
	12	Sarcobatus baileyi / Sitanion hystrix
	10	Artemisia tridentata / Poa secunda
	10	Atriplex confertifolia / Bromus tectorum
	5	Artemisia tridentata / Grayia spinosa

Poa nevadensis / Carex sp. Community is <1% of Any One Mapping Unit And is Not Noted on The Map.



Prepared by W. H. Blackburn, 1969, Renewable Resources Center, University of Nevada; From Bureau of Land Management Base Map.

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Vegetation and soi
Watershed.

DATE LOANED	BORROWER

(Continued on reverse) Forr